PUBLIC WORKS

Sept. 1951

CITY, COUNTY AND STATE

fuse Collection and
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gress Report on
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dio in Civil Defense
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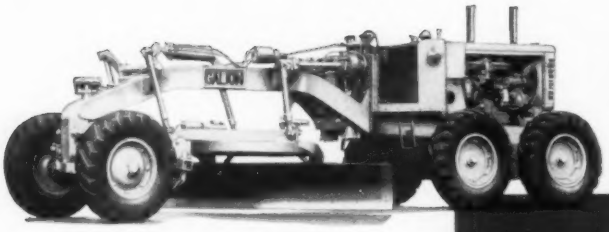
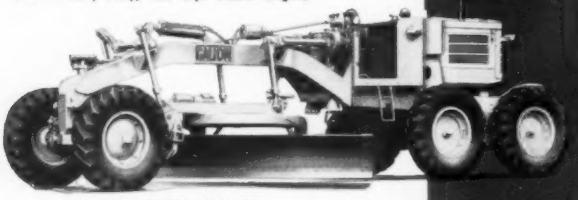
ne "Shorts" Show Better
Ways for Municipal Work

Milton Rosen, Commissioner of Public Works of St. Paul and President of the American Public Works Association. More information on page 30.

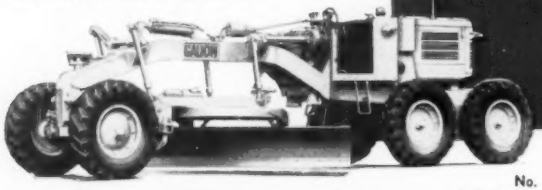
GALION GRADERS



No. 118 MOTOR GRADER
Extra Heavy-Duty, 100 h.p. Diesel Engine



No. 104 MOTOR GRADER
Heavy-Duty, 76 h.p. Diesel Engine



No. 203 MOTOR GRADER
Medium Heavy-Duty, 70 h.p. Diesel Engine

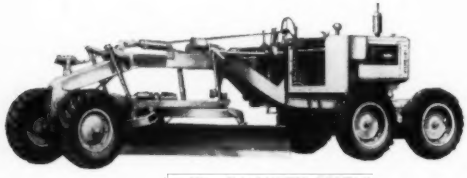
* STANDARD EQUIPMENT includes

Same size tires..... on front and rear.
Manual steering with hydraulic booster.

* on Nos. 118, 104, and 203

COMPARE BEFORE YOU BUY !

Every feature necessary for top performance is included as STANDARD EQUIPMENT on Galion Nos. 118, 104, and 203 Motor Graders. When you compare prices--also compare standard equipment--and you will see why GALION gives you more for your money.



No. 303 MOTOR GRADER
Medium-Duty, 50 h.p. Diesel Engine, Hydraulic Booster Steering and Large Front Tires are available as extra equipment.

A size for every need and use. Write for information on the size in which you are interested.

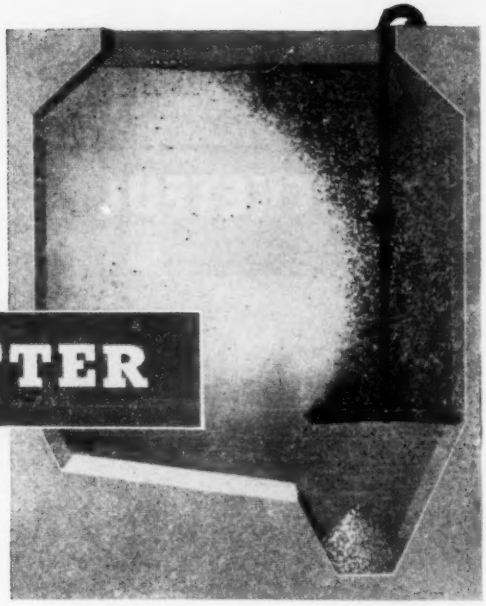
GALION

ESTABLISHED 1907 **MOTOR GRADERS · ROLLERS**

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

6
IMPORTANT BASIC FEATURES

Chicago
AER-DEGRITTER



MAXIMUM REMOVAL

CLEAN GRIT

NO MECHANISMS

LOW COST

SIMPLE STRUCTURE

AIR CONTROLLED VELOCITIES INDEPENDENT OF FLOW

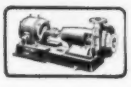
The Chicago Aer-Degritter provides the only method of removing grit and sand from sewage without movable mechanical equipment. Air introduced through Chicago Swing Diffusers and Precision Diffuser Tubes controls the velocity of the flow. All sand of 0.2 mm. (65 mesh) and larger is washed and deposited in a hopper at the bottom of the tank.

Analysis of grit removed by this system shows less than 10% volatile matter and only a negligible trace of putrescible organics. Because course sewage material will not interfere with the operation of the Aer-Degritter and because it does not affect the hydraulic design of the plant, Aer-Degritters may be installed ahead of all mechanical equipment.

Chicago Aer-Degritters are operating successfully at Oildale, Calif., Columbus, Ohio, Tomah, Wis., Bellaire, Texas and Sedalia, Mo. Aer-Degritters being installed include Fort St. John, B. C., Warsaw, Ind., Elmira, N. Y., Oklahoma City, Okla., Port Washington, N. Y., Anderson, S. C. Design flows of these plants range from .75 to 160.0 MGD.

CHICAGO PUMP COMPANY
SEWAGE EQUIPMENT DIVISION

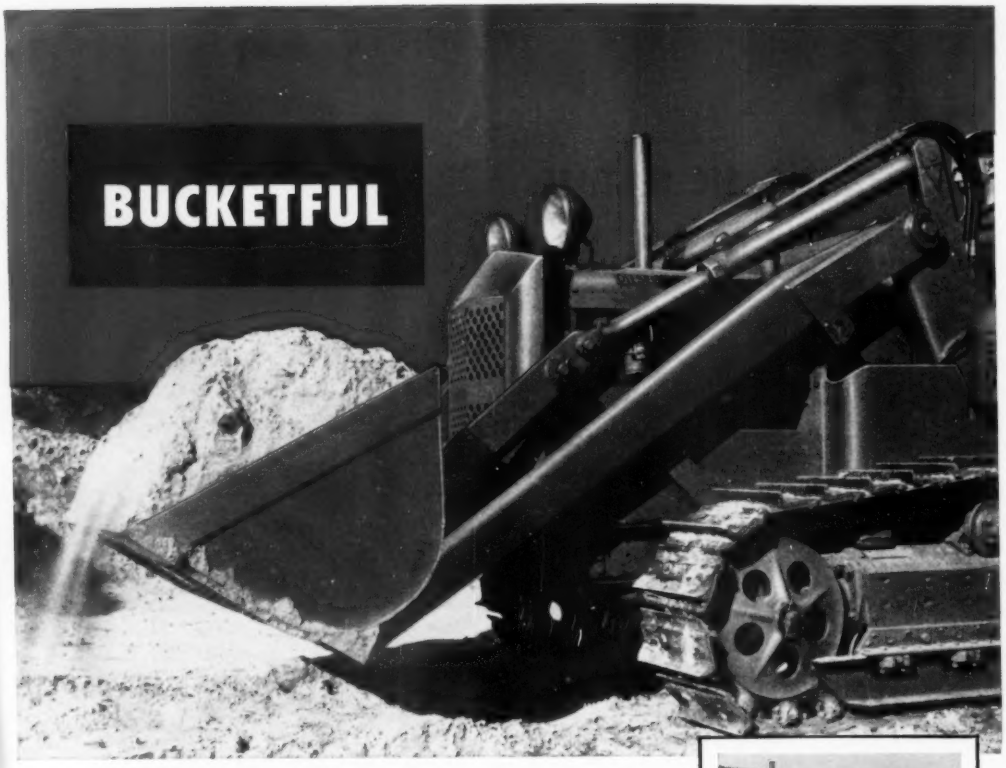
2300 WOLFRAM STREET **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

CHICAGO SEWAGE EQUIPMENT



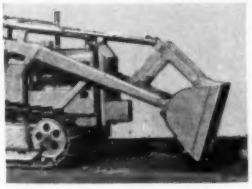
of Cost-Cutting Features

When it comes to cutting loading costs . . . stepping up profits, the Oliver Model "B" Crawler and Ware Loader is "loaded" with *plus* features.

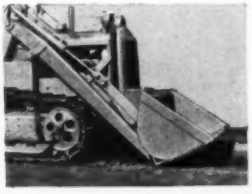
Take the hydraulically controlled bucket, for example. 110° bucket rotation and 28° "tilt back" give you a full bucket every time. "Breaking out" action is 3 times the lifting effort of the loader . . . a particularly important advantage when loading out hard-packed material or for stripping operations. Bucket level is automatically maintained when lifting load, preventing wasteful spillage. You can control speed of discharge . . . fast or slow, easily and gently. And, even with the "tilt back" action, you still have a 32° (from vertical) dump angle . . . a control range no other loader can match. You get bigger loads . . . *faster!*

The Oliver-Ware "B" loader was designed and built exclusively for Oliver Model "B" tractors. Its ideal fit with the tractor eliminates unneeded dead weight and assures maximum stability for the entire unit. The Oliver semi-rigid axle allows limited oscillation of the track, eliminating the possibility of track-frame distortion. A hydraulic shock absorber smooths out pressure surges . . . prevents damage to loader and tractor parts.

For complete information on how the Oliver-Ware Model "B" tractor loader can cut costs for you, see or write your Oliver Industrial Distributor.



Plenty of power, plus the wide angle of bucket rotation, assures faster, more positive digging. 28° "roll back" assures maximum break-out action for a full bucket every time.



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Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of industrial wheel and crawler tractors

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

PUBLIC WORKS
Magazine

Edited by W. A. Hardenbergh and A. Prescott Folwell

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THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

THE EDITOR'S PAGE

This Messed-Up Matter of Handling Reserve Officers

OVER the past year there have been many complaints over the way the military services have handled reserve personnel. Now, a subcommittee of the House of Representatives has turned in a report on this subject which should make a number of military faces quite red. It is likely, however, that is about all the good it will do.

Too many of our military folks think that all you have to do is to punch a button on a tabulating machine. Usually a batch of cards will flutter out and the men they represent can be ordered to duty without bothering to give any thought to much of anything else. But that is no way to pick personnel.

There are, of course, two phases to this matter of reserve manpower. One is the necessity for using our professionally trained men where they will be of maximum value to the nation. The other, and the one we are talking about primarily here, is the matter of common sense, good judgment and fair play to the average run of reserve officers. Without going into detail or mentioning any cases, there has been some lack of all three of the essentials mentioned above.

Some of the reasons why these things have happened appear to be discernible. Whether the military services can correct them or not seems questionable. If not, responsibility should be turned over to some civilian agency. The job is a very large one, but it is also an important one.

Sewage Treatment: What You Want to Know About it Today and Tomorrow

DESIGNING a sewage treatment plant requires a wide knowledge of the methods of treatment, the processes involved, the characteristics of the waste and, above all, we believe, the equipment available. With very few exceptions, any plant that does not utilize the most modern equipment and methods of treament does not represent a good investment for a community. Money put into a sewage treatment plant is gone; it never comes back. The most we can hope for is that the plant for which the money was spent will serve usefully for many years.

In our October issue will be published a series of articles by outstanding men covering the various methods of treatment. As authors for these articles we have selected men employed by the various manufacturers, men who are recognized specialists in the various methods of treatment. These are the men to whom many consulting engineers turn for advice on the knotty problems that so often arise in design, and men who are found on the speaker's list of many of our national meetings.

This series of articles will help every man engaged in this field of work. In case a national emergency should occur, we believe the data they present would be of outstanding value in providing a guide for design, using modern equipment, for the many sewage and industrial waste treatment installations that will be needed, just as such installations were needed in World War II. Such a guide will be the more needed because any emergency imposes on engineers the necessity of doing things they have never done before. In the case of planning for sewage and industrial waste treatment, we believe these articles will be a most valuable guide on which the program can be oriented.

Productive Maintenance for the Field of Public Works

ONE of our largest corporations has announced a new plan to help industry get the most productivity from its existing facilities. The General Electric Company, author of this plan, believes it will minimize lost production time and forced idleness due to equipment failures, permitting maximum output from existing equipment and facilities.

An effective production maintenance program consists of (1) an adequate staff of trained maintenance men, armed with (2) the tools needed to perform properly the functions of (3) regular, routine checks of operating equipment, and (4) planned outage of this equipment at regular scheduled intervals. Rebuilding and modernizing during times of planned outage is done readily from (5) an adequate stock of spare parts.

The public works field needs such a program, and this applies to water supply systems, street and highway departments and sewerage and refuse disposal facilities. The principles involved are essentially the same whether for industry or for public works, and they can be and should be applied to all applicable city, county and state activities.

Balance your street sweeping budget with MOBIL-SWEEPER

You can keep your community happy with cleaner streets . . . *at lower cost.* Every budget is getting a closer check nowadays. Make sure you stay within yours by using the faster, more efficient Mobil-Sweeper.

Ten years of Mobil-Sweeper development brings you unsurpassed sweeping action. On streets, gutters, alleys, highways, parks and airports . . . even steepest hills, you get top sweeping performance.

Cleaner Sweeping is accomplished through the longer draught arms that make the rear pickup broom "full-floating" in the true sense. Deepest dips get a clean sweep where ordinary sweepers would skip over or drop refuse.

Gutters Are Swept More Thoroughly because the special "decreased arc" type gutter broom segments retain their flipping action longer, giving hundreds of extra miles of clean sweeping.

More Pavement Can Be Swept without stops because Mobil-Sweeper's big 200-gallon water tank provides spray for more pavement with fewer refills.

And Don't Be Fooled On Dirt Hopper Capacity . . . be sure that your sweeper fills to its rated capacity every time under normal operating conditions. Mobil-Sweeper fills its 2⅔ cu. yd. hopper to the overflow every time – that's what counts.

Maintenance Is Less Costly because the International Harvester engine lends itself to your standard maintenance.

It's The Safest Sweeper Built – Mobil-Sweeper protects the driver with shatterproof windshield, steel cab and 4-wheel hydraulic brakes. The low overall height and steel cab permit passage under low-hanging trees.

Write for details on how your community can save on street sweeping costs today!

MOBIL-SWEEPER
DIVISION OF
THE CONVEYOR CO.
3260 E. SLAUSON AVENUE
LOS ANGELES 58, CALIF.

CONVEYCO

THE CONVEYOR COMPANY
3260 East Slauson Avenue, Los Angeles 58, Calif. PW9

Gentlemen:
Please send catalog with complete details and specifications for the Mobil-Sweeper.

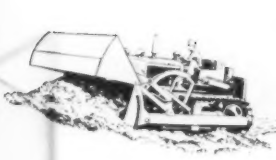
Name _____ Title _____

Address _____ City _____

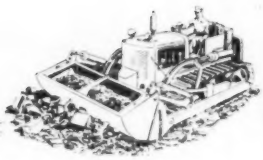
County _____ State _____

Get full details of this month's new products . . . mail your Readers' Service card today.

"Cuts Costs

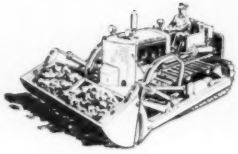


Prepares the site

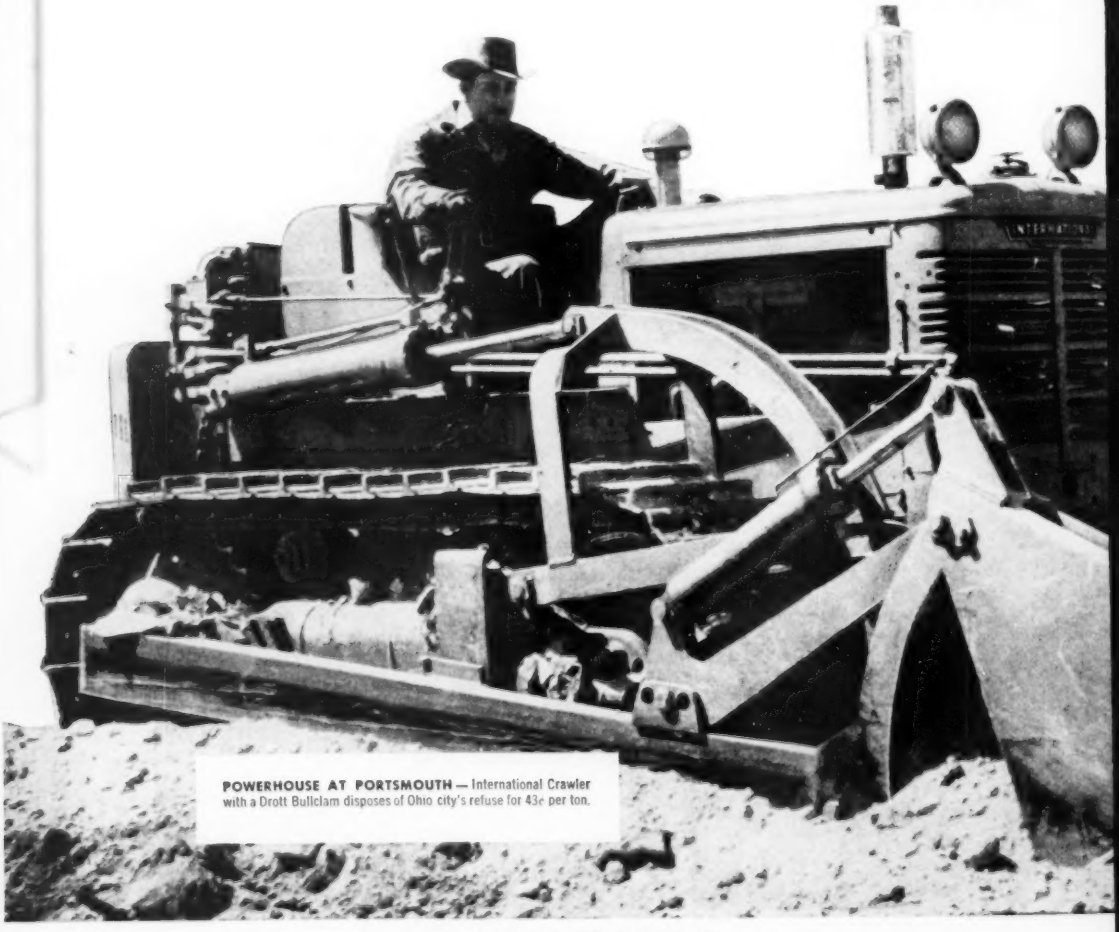


Crushes and compacts refuse

Transports and spreads earth cover



Grades and levels finished area



POWERHOUSE AT PORTSMOUTH — International Crawler with a Drott Bullclam disposes of Ohio city's refuse for 43¢ per ton.

Now's the time to mail this month's Readers' Service card.

Three-Quarters!"

Says Portsmouth, Ohio

One-Man Sanitation Squad—International Crawler teamed up with Drott Bullclam—does complete sanitary-fill job for one-fourth the cost of previous disposal method

When Portsmouth decided to turn bad to good—to cut the cost of refuse disposal and to improve waste property at the same time—they really went all the way.

Portsmouth "got Drott"—a Drott Bullclam powered by a rugged red International Crawler. Then things happened.

Disposal costs dropped to 43¢ per ton of refuse—a quarter of the previous cost. Eyesore gullies were reclaimed, turned into recreation grounds. All with one outfit and one operator.

The International Crawler-Drott Bullclam combination is the ONLY one-man equipment designed to handle all four steps of the complete sanitary-fill job. It scoops out the excavation, spreads the refuse, crushes and grinds the bulk, compacting and ironing it out with brute International Crawler power behind the specially curved front of the Drott Bullclam. Then it spreads and grades the cover dirt to finish the job.

It's a one-man sanitation squad! Ask your International Industrial Distributor for details. Or write today to:

Drott Manufacturing Corporation, Milwaukee 8, Wisconsin
International Harvester Company, Chicago 1, Illinois

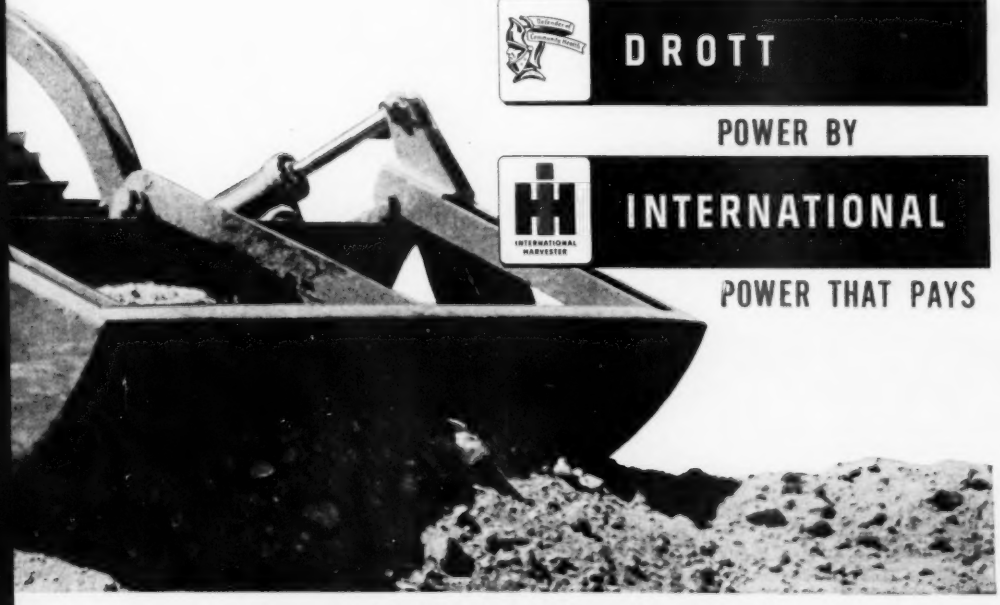
BULLCLAM BY

DROTT

POWER BY

INTERNATIONAL

POWER THAT PAYS



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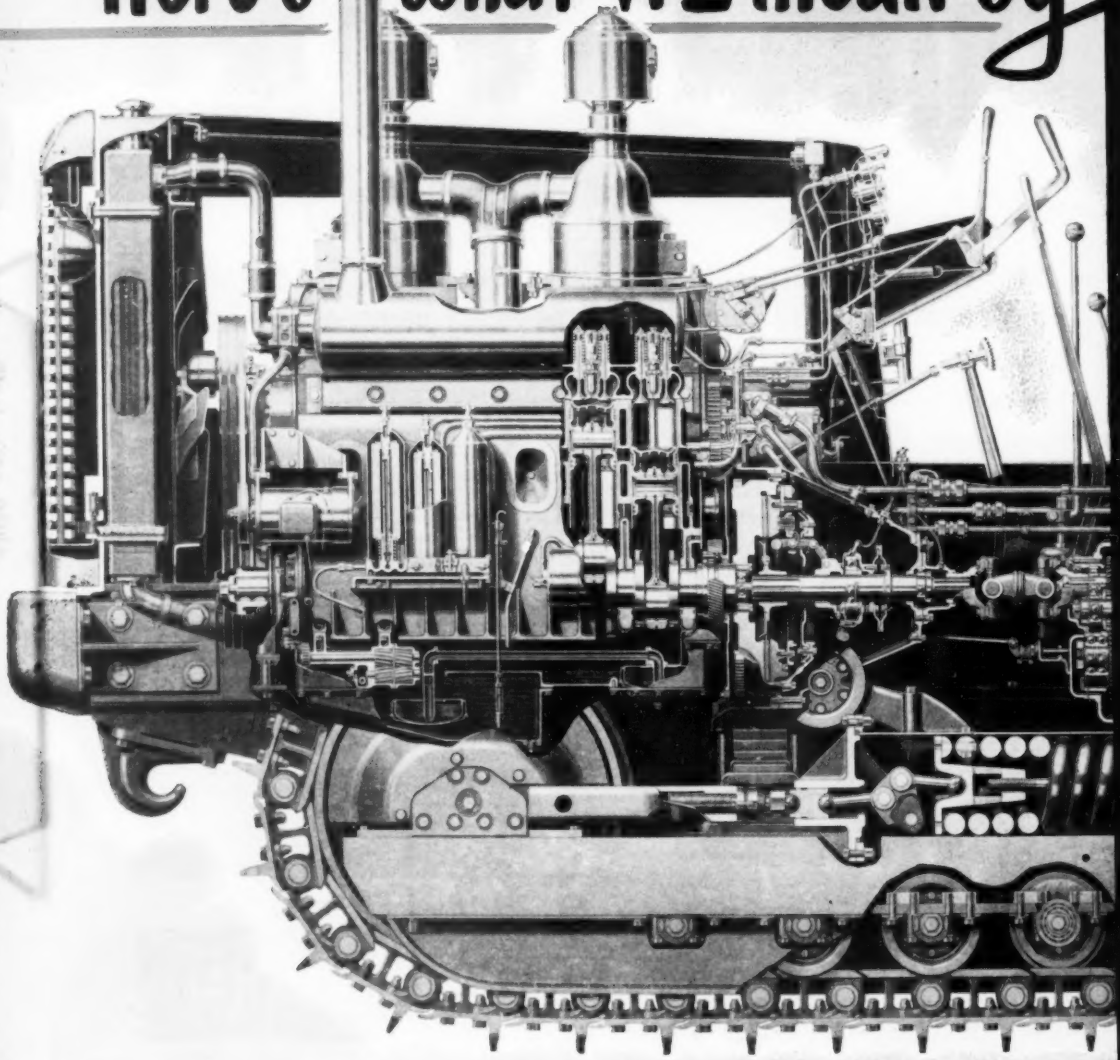
Here's what WE mean by



HD-5
40.26 drawbar hp.
11,250 lb.

HD-9
70 drawbar hp.
18,800 lb.

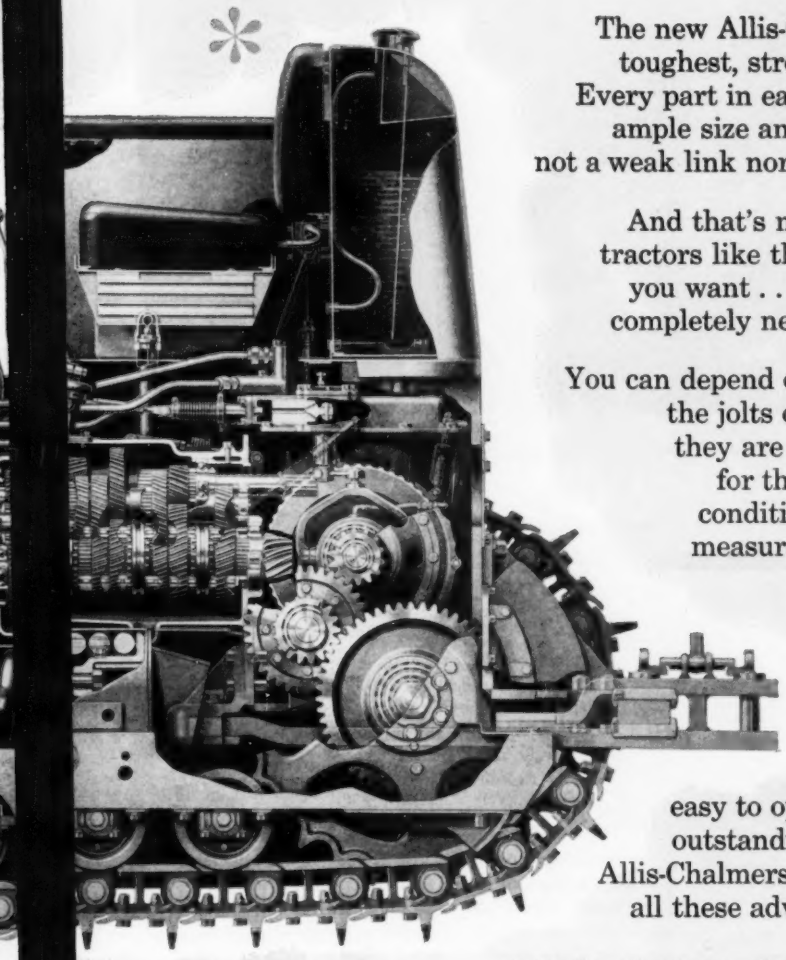
* **HD-15**
102 drawbar hp.
27,850 lb.

HD-20
Hydraulic Torque Converter Drive
175 net engine hp.
41,000 lb.

The Newest, Finest Tractor Line on Earth!

• DESIGNED FOR YOUR JOB • BUILT TO TAKE IT • EASY TO OPERATE • EASY TO SERVICE

BUILT TO TAKE IT



The new Allis-Chalmers tractors are the toughest, strongest tractors ever built. Every part in each of the four models has ample size and strength to do its job — not a weak link nor a compromise anywhere.

And that's no accident! To bring you tractors like these . . . with the qualities you want . . . Allis-Chalmers built 'em completely new — from the ground up.

You can depend on them to take the loads, the jolts of today's jobs . . . because they are modern tractors designed for the most grueling operating conditions. They will more than measure up to your expectations!

Here are just a few of the many reasons why this NEWEST, FINEST TRACTOR LINE ON EARTH is *Built To Take It* . . . besides being easy to operate, easy to service and outstanding in performance. Your Allis-Chalmers dealer will gladly explain all these advantages . . . see him NOW.

- All-Steel Welded Construction
- More Power with Bigger Engines — Longer Engine Life
- More Weight, Greater Strength
- Long-Lasting, Large Diameter Clutches
- Extra Heavy Main Frames — No Extra Reinforcement Needed for Front-Mounted Equipment
- Double Reduction, Straddle-Mounted Final Drive Gears with Live Sprocket Shafts and Caged Bearings
- Positive Operating Track Release — Works in Oil on HD-9, HD-15, HD-20
- All New, Specially Designed Track Assembly
- Positive-Seal Truck Wheels, Support Rollers and Idlers — Mounted on Tapered Roller Bearings. 1,000-Hour Lubrication!

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Fights Snow 3 Ways

In summer mud or winter snow this powerful four-wheel-drive PAYLOADER is a big producer. When the earthmoving season is over it is quickly and easily equipped with a V-plow or a reversible or one-way plow. It can crawl through heavy drifts or swoosh through lighter snows at speeds up to 16 mph.

Powerful hydraulic control exerts up to 3 tons of lifting capacity for "break-out," or tremendous down-pressure to dig in fast. Power boosted rear wheel steering is easy and responsive . . . four speeds in reverse as well as forward assure the right speed for every need. All-weather cab is optional.

For summer or snow, for all season GO the Model HM PAYLOADER is a year-round tax saver. Your PAYLOADER distributor has full facts on this and five other sizes of PAYLOADERS. Write the Frank G. Hough Company, 761 Sunnyside Avenue, Libertyville, Illinois.

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THE FRANK G. HOUGH CO. • Since 1920

Get full details of this month's new products . mail your Readers' Service card today.

OHIO
Report No. 8267

FORD TRUCK ECONOMY RUN

"We haul Over 6 tons of gravel for only 3¢ a mile!"

—says **ROY GEETING**
Construction Man, Eaton, Ohio

"My Ford Dump Truck saves me money every mile," says Mr. Geeting. "I save about a dollar a day or almost 300 dollars a year on gasoline alone!"

Contractor Geeting uses his 1950 Ford F-6 Dump for all kinds of roadwork (i.e., hauling sand and gravel, sanding hills, plowing snow). He says, "It's the ideal truck for cramped quarters because it steers and handles so easily."

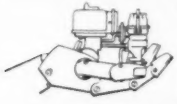
He entered his truck in Ford's nation-wide Economy Run and says: "My Ford traveled 21,003 miles with loads of over 6 tons. Yet it cost only $637.83 for gas, oil, maintenance and repairs. That's a running cost of only 3.04 cents a mile!"

Like others who rely on Ford for low running costs, Roy Geeting is sold on the money-saving service he gets from his Ford Dealer. For more facts on the trucks that last longer *and* save you money every mile—mail coupon below.

This Ford F-6 Dump for '51, like Mr. Geeting's truck, is a favorite with construction haulers. Power choice of 3 great engines . . . 100-h.p. V-8, 110-h.p. Big Six and 95-h.p. Six. Available with the 5-STAR Cab, or, at added cost, the 5-STAR EXTRA Cab for more efficient driving, safety and convenience. Single speed rear axle standard, 2-speed axle also available (at extra cost) with wide range of ratios for operating flexibility.

Availability of equipment, accessories and trim as illustrated is dependent on material supply conditions.

POWER PILOT HELPS CONSTRUCTION MEN HOLD DOWN HAULING COSTS



The Ford Truck Power Pilot is a simpler, fully-proven way of getting the most power from the least gas. It is designed to synchronize firing *twice* as accurately.

You can use regular gas . . . you get no-knock performance. Only Ford in the low-price field gives Power Pilot Economy.

FORD TRUCKING COSTS LESS

because FORD TRUCKS LAST LONGER!

Using latest registration data on 7,318,000 trucks, life insurance experts prove Ford Trucks last longer!

SEE "FORD FESTIVAL" STARRING JAMES MELTON ON NBC-TV

MAIL THIS COUPON TODAY!

FORD Division of FORD MOTOR COMPANY
3257 Schaefer Rd., Dearborn, Mich.

Send me without charge or obligation, detail specifications on Ford Trucks for 1951.

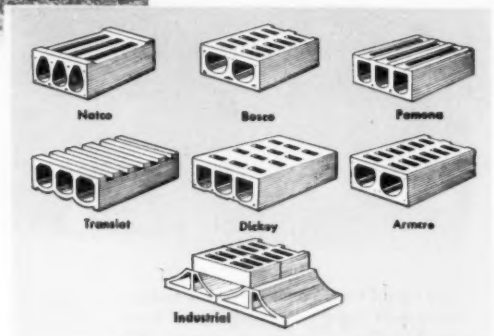
Full Line ☐ **Heavy Duty Models** ☐
Light Models ☐ **Extra Heavy Duty Models** ☐

Name _____
(Please print plainly)
Address _____
City _____ Zone ____ State ____
Check here if student ☐

Now's the time to mail this month's Readers' Service card.

For Better Trickling Filter Results

120' Biofilter, 3.5 mgd cap. at Frederick Maryland



These blocks are Easy to Lay, Acid Resistant, Proved by Use and Won't Clog

1.

Trickling Filter Floor Institute *specification* underdrains are used in all modern filters where better results and trouble-free operation are desired. They are scientifically designed for that purpose and made of the finest quality vitrified clay. The size of the top openings insures proper ventilation of all the filter media and free discharge of the filter effluent. The run-off channels are extra smooth for non-clogging, quick drainage.

These blocks will carry applications up to 50 MGAD. Unskilled labor can lay them easily because they are light-weight and self-aligning. And the blocks are strong enough to work on after laying and to support safely even very deep filter media. They are best for all kinds and shapes of filter.

On *your* next filter, use the best equipment you can get . . . and give it a specification floor of *Vitrified Clay Filter Bottom Blocks*. Ask any member of this Institute for full engineering details. Write today.

2.

When planning a trickling filter, don't take chances on the equipment. Choose a rotary distributor made by one of the leading makers. The firms whose equipment has been pictured in this series of advertisements have long records of achievement. Their experience and advice often can prove invaluable. Feel free to consult them any time about your filter problem.

And don't take chances with the filter floor either. Use the best. Do as Whitman, Requardt & Associates did at Frederick, Md. Call for a *specification* floor . . . a *Vitrified Clay Filter Block* floor . . . the best kind of filter floor available.

TRICKLING FILTER FLOOR INSTITUTE

National Fireproofing Co.
Pittsburgh 22, Pa.

Pomona Terra-Cotta Co.
Pomona, N. C.

W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.

Bowerston Shale Co.
Bowerston, Ohio

Texas Vitrified Pipe Co.
Mineral Wells, Tex.

Ayer-McCarel-Regan-Clay Co.
Brazil, Ind.

Industrial Materials Co.
Philadelphia 34, Pa.

Thousands use our Readers' Service card to keep up to date . . . do you?

Rugged "Cat" Diesels speed work on thousands of public works projects. Here two Gardner-Denver portable compressors, each powered by a "Caterpillar" D13000 Engine, are used to drive piling for shoring an underpass in Washington, D. C.

There's a big job ahead

The job of maintaining more than three million miles of roads and streets is a vital part of America's fight to be strong and stay free. And it won't be easy. We're entering a critical period that will separate "the men from the boys" in the field of construction and maintenance equipment.

Military needs and Defense Rated Orders are taking their share of "Caterpillar" production. Shortages of steel and other materials add to the difficulty of supplying the demand for new machines. This means that *present equipment must be kept in use.*

"Cat" Diesel Engines, Tractors and Motor Graders are built with the stamina to stand up and serve you faithfully for a long time. But how they're operated and maintained is up to you. Good care pays off.

You can add many hours to equipment life if you follow sound maintenance practices. Anticipate your parts needs. Talk it over with your "Caterpillar" dealer. He is qualified to give competent opinion. If a part is not readily available, he has the tools and knowledge to rebuild many worn parts — and keep your equipment on the job.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

You're the Doctor

Don't let your engine overheat. Maintain the cooling system, keeping it free of scale, rust and sediment. Use soft or treated water and, when freezing temperatures exist, protect your engine with anti-freeze. Clean the radiator periodically, removing foreign matter from the core by brushing or washing. Use chemical flushing solutions. Prevent engine troubles which come with overheating.

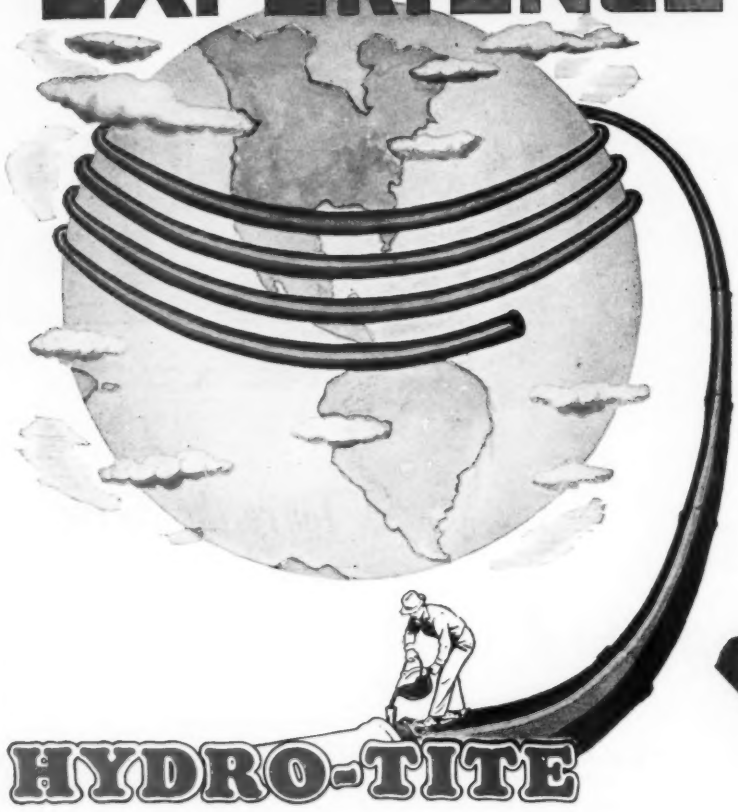
REREAD YOUR OPERATOR'S INSTRUCTION BOOK
GOOD CARE CAN ADD MANY EXTRA HOURS OF EQUIPMENT LIFE

CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

Nothing takes the place of

EXPERIENCE



HYDRO-TITE

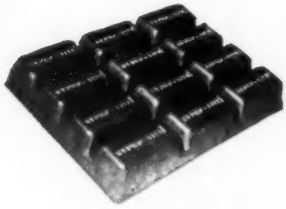
HYDRO-TITE

has joined more than a million miles of cast-iron water mains in the past 40 years with complete satisfaction—Used with FIBREX, the bacteria-free joint packing, it makes an unbeatable combination. All around the world NOTHING takes the place of HYDRO-TITE.

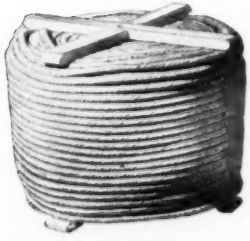
Free working samples on request.

HYDRO-TITE
(POWDER)

HYDRO-TITE
(LITTLEPIGS)



FIBREX
(REELS)



HYDRAULIC DEVELOPMENT CORPORATION

Main Sales Office 50 Church Street, New York *General Offices and Works* W. Medford Station, Boston, Mass.

Thousands use our Readers' Service card to keep up to date . . . do you?

Fourth of a Series of ads giving

TIPS on TUBE USE

to help conserve copper water tube

Proper care in the selection and use of copper water tube will assure maximum tube life. Make sure that the tubing you use is properly annealed and easy to bend. Frequent inspections throughout the production of Wolverine copper water tube assure you of consistent temper and grain size.

Uncoil only enough tube for the job at hand. Uncoiling and recoiling work-hardens the tube—making it more difficult to install.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, non-ferrous tubing
1451 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Use good tools. Choose good tube—care makes it last.

Plants in Detroit, Mich. and Decatur, Ala.

Buy From Your Wholesaler

Export Department, 13 E. 40th St., New York 16, N. Y.

Get full details of this month's products . . . mail your Readers' Service card today.

5,000 to 5,000,000

Towns and cities of all sizes throughout the United States are regular users of McDONALD Waterworks Brass. For 95 years the McDONALD Diamond has meant "Uniform Top Quality". Shown above is E-4701 corporation stop with various type adaptors and 3 part copper coupling.

An illustrated brochure with detailed specifications showing our complete line of Waterworks Brass will be sent to you promptly on request. A. Y. McDonald Mfg. Co., Dubuque, Iowa.

EST. 1856

McDonald

BRASS GOODS • PUMPS • OIL EQUIPMENT

To a man who'd like to rid his town of garbage . . . forever!

There's a growing trend, clear across the country, towards making whole cities and communities *permanently garbage-free.*

This is being done through ever increasing municipal sponsorship of the revolutionary General Electric Disposall®—which eliminates garbage by shredding food-wastes into tiny particles and washing them away, as *processed* food-wastes, to septic tank or sewer.

Because the advantages of garbage-free homes and streets are obvious—in improved public health and cleanliness, and reduced sanitation costs—some of you may already have discussed the possibility of adopting the G-E Disposall method as a civic project in *your* community.

With nearly 20 years of experience in creating and developing the food-waste disposer, General Electric is in an excellent position to give you the benefit of its technical and practical knowledge in this field.

Why not—for a start—take full advantage of our files of specialized information? Copies of the booklets and reprints detailed on the right are immediately available at no cost or obligation to you. Simply write General Electric Company, Dept. P9, Bridgeport 2, Connecticut.

Send for the free, non-technical, consumer booklet on municipal installations: "Dad—what was Garbage?"

"Dad—what was Garbage?"

SEND FOR THIS SPECIALIZED INFORMATION!

1. Booklet—*"The Use of General Electric Disposalls® with Private Septic Tank System."*

2. Booklet—*"Technical Data on Food-waste Disposal Through the Public Sewage System."*

3. Reprints of articles by leading authorities on sewage and garbage disposal problems.

4. Reprints of articles giving details of the garbage elimination plan in Jasper, Indiana—where approximately ¾ of all homes already have G-E Disposalls installed.

G-E DISPOSALL

CONVERTS FOOD-WASTE TO SEWAGE—ELIMINATES "GARBAGE"

Trim and specifications subject to change without notice.

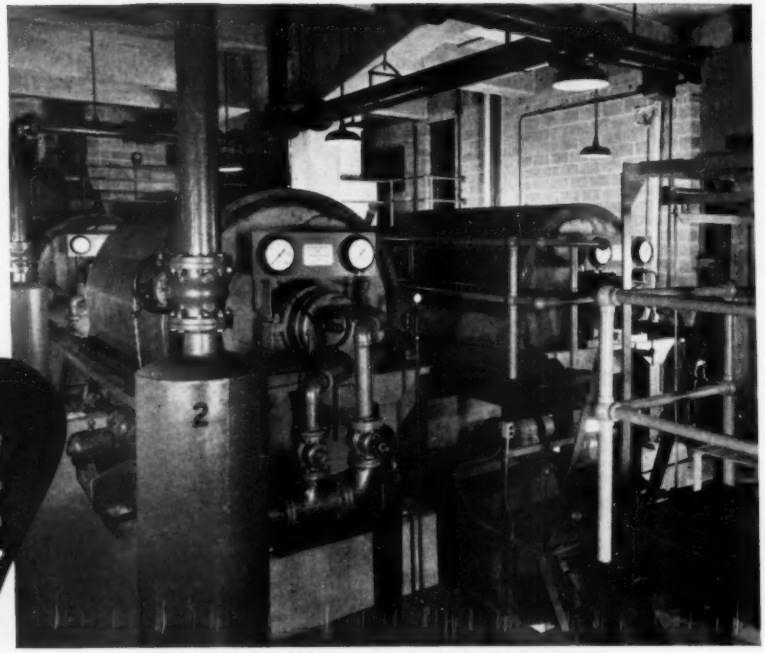
You can put your confidence in—

GENERAL ELECTRIC

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

See General American for

CREATIVE FILTER ENGINEERING



Designed to do your job best!

Section of the filter room showing Conkey Sludge Filters in recently opened Bridgeport primary treatment plant.

Newly completed Bridgeport, Conn., Sewage Treatment Plant uses Conkey Sludge Filters

Bridgeport's new East Side primary treatment plant handles a high percentage of diversified industrial wastes. Careful planning plus several unique innovations were required to successfully dewater and incinerate this sludge. It was essential that the sludge filters . . . *heart of any sewage treatment plant* . . . would dewater rapidly, continuously and automatically at the lowest possible cost. Conkey Sludge Filters were selected and have provided *better filtration* . . . fulfilling each necessary requirement perfectly.

Typical Conkey Sludge Filter features are the effective plastic backing plates for filter cloth support, the Uscolite pipe lines and drainage bells, the efficient double scraper arrangement, specially formulated protective coatings and many newly developed components made of special plastics.

Bridgeport, Chicago, many other cities . . . private industry in many places . . . all have found that creatively engineered Conkey Sludge Filters "do a better job" and do it at minimum cost. Bulletin No. 100 on Conkey Filters belongs to every progressive sewage engineer. Write for your copy today.

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Dryers, Towers, Tanks, Bins, Pressure Vessels

OFFICES IN ALL PRINCIPAL CITIES

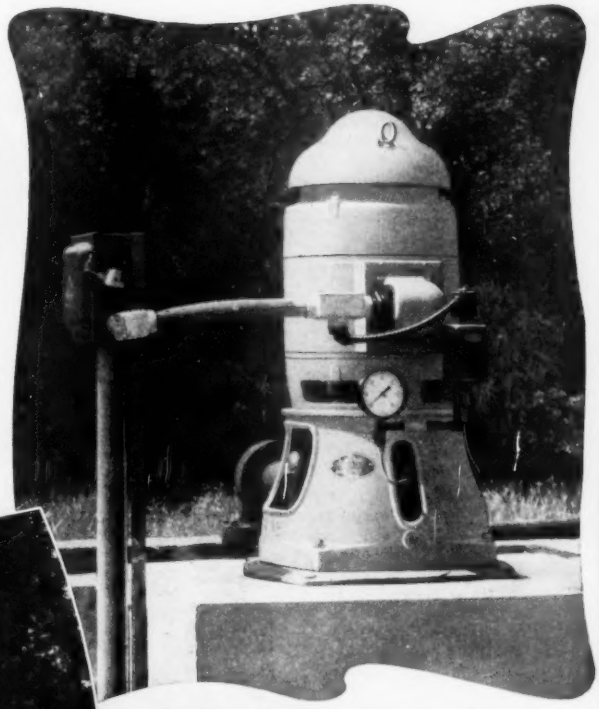
PROCESS EQUIPMENT DIVISION GENERAL AMERICAN TRADE MARK

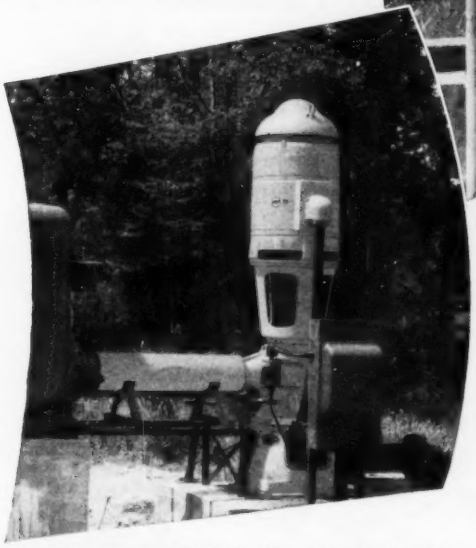
Process Equipment Division
GENERAL AMERICAN
Transportation Corporation
Sales Offices: 10 East 49th St., New York 17, N. Y.
General Offices: 135 S. La Salle St., Chicago 90, Ill.
In Canada: Canadian Locomotive Company, Ltd., Kingston, Ont.

INSTALLED FOR THE CITY OF

TOMS RIVER, New Jersey

. . . WITH her population more than doubling during the summer season, the resort city of Toms River, New Jersey, was facing a serious water shortage problem. Five old, inefficient and not too dependable wells were being operated with suction pumps. Layne was called in for a discussion of what could be done with limited funds. Layne's recommendations resulted in a contract for the rebuilding and re-equipping of one old well and the drilling and equipping of a new one. The contract also called for equipping one pump with an auxiliary, gasoline engine drive, on one of the pumps, for use in case of electric power failure. Without delay everything was finished according to the contract, giving the city of Toms River a water supply that more than fulfills present needs. The new equipment also greatly reduced operation cost which more than justified the investment.





Built Complete by Layne

Everything, with the exception of some wiring for the Toms River job was handled complete by Layne in one inclusive contract. Each phase of the work was under the supervision and direction of Layne engineers who made sure that all materials and method of installation were up to Layne's very exacting standards. The entire job handled in one contract was an important factor in saving time, extra expense and unnecessary worry for the Toms River city officials. Furthermore it assured the city of obtaining a completely satisfactory job throughout.

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

★★★★★★★★★★★★★★★★★★★★★★★★★

Catalog on Layne
WELL WATER SYSTEMS

Fifty-two pages of highly interesting and fully illustrated details on the Layne method of building the world's finest well water systems. Shows pictures of many installations for cities, factories, pipe lines, petroleum refineries, etc. Sent without obligation.

★★★★★★★★★★★★★★★★★★★★★★★★★

Layne
WATER SUPPLY
WELLS & PUMPS

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

Worth its weight

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

Get full details of this month's new products . . . mail your Readers' Service card today.

. . . in installation savings

Are you finding it increasingly difficult, in the face of today's economy, to undertake needed water-line construction?

If so, you may find—as other planners do—that Transite* Pressure Pipe can help provide a practical answer to your problem. For this pipe, in addition to its continuing, long-term savings, offers an opportunity for economies in installation *that may go far in helping you contend with rising costs and manpower shortages.*

Transite Pressure Pipe offers a combination of advantages which speed and facilitate water main installations all along the line—from the time the pipe is first received, to final placement of the line in service and restoration of normal street traffic. Not only do pipe laying crews find this modern pipe easy to work with, but its unique features make for a more compact, efficient and economical operation in virtually all the construction phases of water-line extension projects.

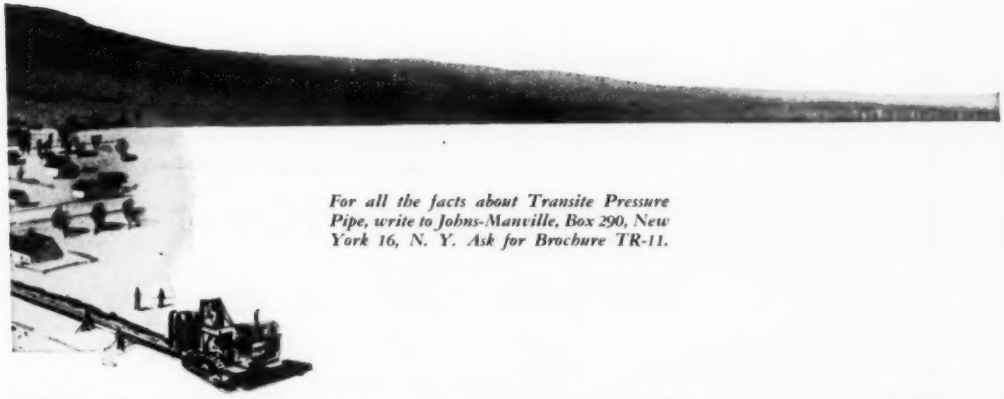
Economies start as soon as a shipment of Transite Pipe is received. Because it is light in weight, unloading and other handling operations are simplified. More footage can be carried per truckload, trucking costs are lowered, and distribution on the job site is faster. And except for the larger diameters of pipe, the sections can be lowered into the trench by hand, or with the aid of rope slings.

Assembly, too, is both rapid and economical. The flexibility of Transite's joints permit the pipe to be laid around wide curves without the need for special fittings. The Simplex Couplings require no calking or hot compounds; they are quickly and easily assembled to provide lastingly tight joints. *And with this pipe you can check for proper assembly immediately after the pipe ends are joined.*

Makes pipe-laying an assembly-line operation

This combined feature of rapid assembly and assurance of joint-tightness as fast as the line is laid, is the key to an important Transite advantage: it means that trench excavation, pipe laying, and backfilling operations can follow in quick succession—often under the supervision of one foreman. It makes pipe-laying virtually an assembly-line operation in which the trench can be closed in a minimum of time. This assures more economical use of excavation and earth handling equipment, reduces the expense and hazards of long stretches of open trench, and helps button-up the job with the least possible expenditure of time, labor and money.

These *initial* savings . . . plus the *long term* economies that have been effected in thousands of installations . . . are two good reasons why you should have the complete story about this modern asbestos-cement pipe developed and produced by Johns-Manville to carry water more efficiently and more economically.



For all the facts about Transite Pressure Pipe, write to Johns-Manville, Box 290, New York 16, N. Y. Ask for Brochure TR-11.

TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark

Now's the time to mail this month's Readers' Service card.

Reduce Refuse Collection Costs

With The All Purpose Unit . . .

Ashes . . . Rubbish . . . Garbage : . . In fact any type of refuse . . .
The ROTO-PAC takes them all in its stride.

Speed in loading and adaptability in taking any type of refuse plus high compaction and low operating costs — These things add up to greater savings.

Here's where the savings start . . . Automatic continuous loading and packing . . . Crushes boxes and crates . . . Its low loading height eliminates back strain and other occupational hazards . . . It works on a low operating oil pressure thus cutting down wear and tear on the engine.

You can see why the ROTO-PAC can take it easier, work faster and last longer, without breakdown, than other refuse equipment . . . why users of ROTO-PAC say that their absence rate has dwindled down to almost nothing since the ROTO-PAC was placed on their route . . . why ROTO-PAC operates economically to save you money.

CHECK THESE ROTO-PAC FEATURES!!

Automatic Continuous Loading
Greater Compaction
Lowest Loading Height
Automatic Continuous Packing
Lowest Operating Pressure
Continuous Ash Loader
Doubles As Snow Hauling Vehicle
Lower Cost Operation

ROTO-PAC
by
CITY TANK CORPORATION

MANUFACTURERS OF
Roto-Pac — Street Flushers — Gasoline and Fuel Oil Truck Tanks — Trailers and Semi-Trailers — All Types of Fluid Carriers

CITY TANK CORPORATION, 53-09 97th PLACE, CORONA 68, L. I., N. Y.

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

Plano, Illinois built 102,000 sq. yds. of dustless all-weather city streets for $22,275. The materials used, gravel, sand and SC-3 asphalt, were mixed in place by the SEAMAN MIXER.

Akron, Ohio street officials estimate that the SEAMAN MIXER has saved the municipality thousands of dollars in the construction and maintenance of 400 miles of city streets.

OVER 100 MUNICIPALITIES SAVE UP TO 38% IN STREET CONSTRUCTION

WITH THE

SEAMAN MIXER

The SEAMAN TRAV-L-PLANT — a self-propelled SEAMAN MIXER equipped with spray bar, pump, volumetric meter (optional) and complete tachometer assemblies.

Bituminous, soil-cement or gravel stabilized streets and parkways are lower in cost and higher in load bearing value when the mixing is done with the SEAMAN MIXER.

Here are brief performance stories in a few of over 100 cities owning one or more SEAMAN MIXERS.

Birmingham, Mich. reports a saving of $7,071.64 in labor in the first year of street construction with the SEAMAN MIXER.

City of Modesto, Cal. cut costs of street construction 38% by using a sand-cement base course stabilized with the SEAMAN MIXER.

Jacksonville, Fla. 42 miles of bituminous streets were constructed in 35 working days. All mixing was handled by the SEAMAN MIXER.

St. Paul, Minn., owner of two SEAMAN MIXERS, found that the machines permitted uninterrupted street construction, even during heavy rains.

The SEAMAN TRAV-L-PLANT mixing for an asphalt pavement in Jacksonville, Fla. Note that asphalt is pumped from transport truck and applied by spray bar on the SEAMAN.

Write for the full SEAMAN story and the wide variety of cost-saving work the SEAMAN MIXER does in many municipal applications.

Orlando, Fla. Two contractor-owned and one city-owned SEAMAN MIXERS have done an exceptional job in mixed-in-place sand-asphalt street construction for streets that were hitherto unpaved.

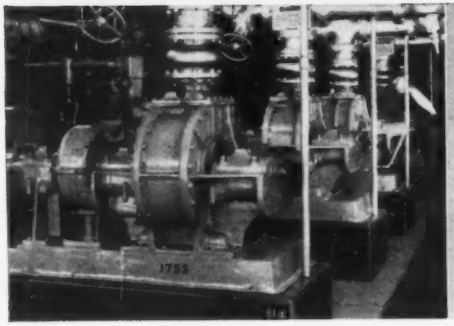
A post card will bring you this FREE book, "Soil Stabilization Methods". 100 pages of pictures and up-to-the-minute detailed highway, street and airport construction methods.

SEAMAN MOTORS, INC.

266 N. 25th STREET
MILWAUKEE 3, WIS.

Need more facts about advertised products? Mail your Readers' Service card now.

NO V-P-I WORRIES WITH R-C BLOWERS



ROTARY

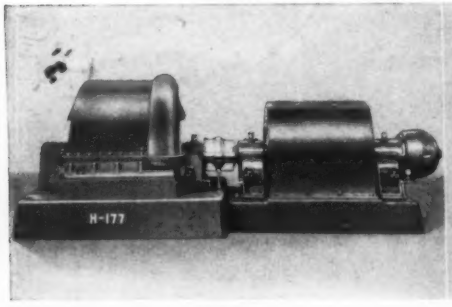
Group of R-C Blowers in midwestern sewage treatment plant, installed 10 years ago and giving excellent service. Capacity of each, 1,800 cfm.

Continuous separation processes in modern sewage treatment depend upon adequate performance of blowers. You can be sure of positive Volume, at the required Pressure and at Low power cost when Roots-Connersville Blowers move the air.

You can obtain this freedom from worry by selecting either R-C Centrifugal or Rotary Positive equipment from our exclusive *dual-ability line*. For large municipal plants, R-C units deliver up to 100,000 cfm. For industrial waste treatment, using small blowers, we supply Rotary Positive units with volume as low as 5 cfm. This wide latitude permits use of blowers closely matched to demand, with resultant economy in first cost and in power consumption.

The services of R-C engineers are always available to help select the best equipment for the sewage treatment job to be done.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Poplar Avenue, Connersville, Indiana



CENTRIFUGAL

A 3-Stage, Type H Centrifugal Blower for aerating sewage. Capacity 13,000 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

Thousands use our Readers' Service card to keep up to date . . . do you?

LETTERS TO THE Editor

IMHOFF DESIGN

In the third edition of Sewerage & Sewage Treatment, page 423, it is stated that the detention period in small Imhoff tanks should be 8 hours, based on 24-hour average flow. This is a much longer period than is usually provided and I am wondering what range of sizes you have in mind as requiring 8 hours detention. The "Handbook of Small Sewage Treatment Plants" deals with populations over 500 and quotes detention periods of 2 to 2½ hours. The article on small Imhoff tanks in PUBLIC WORKS for September, 1947, gives 2 hours detention for very small populations.

For small plants for institutions and Government communities with populations as small as 80 persons (about 1,000 US gals. per day) we have used 3 hours detention at 24 hours average flow.

R. C. Lough,
Ass't. Designing Engineer,
Ministry of Works,
Wellington, N. Z.

(NOTE: The recommended detention period of 8 hours applies only to very small installations serving individual families or otherwise handling small and irregular flows. ED.)

BOOKS IN BRIEF

SOIL TESTING

The primary purpose of this book is to fill the need for a textbook for the teaching of soil testing, but it will certainly be of value as a reference book for engineers and for personnel in soil laboratories. In addition to an introductory chapter, there is a chapter on each of the tests included. At the end of each chapter is an illustrative example, employing recommended data-calculation sheets which minimize computation time and errors. By T. William Lambe, Massachusetts Institute of Technology. 162 pp.; many illustrations. John Wiley & Sons, Inc., New York. $5.

Accelator® *solves high color problem for Bradenton, Florida*

Remodeled plant designed by C. K. S. Dodd, Engineer Sarasota, Florida

2800 G.P.M. Accelator —with automatic chemical feeders and central control. Forced draft Aerator 8 Filters, 12x15 ft. Clarifies, filters, removes color, chlorinates and ammoniates up to 4 m.g.d.

Aerator* AFTER *coagulation reduces CO_2 to 5 p.p.m.

River water of high color (up to 400 p.p.m.) and low alkalinity (down to 8 p.p.m.) is cleaned and polished in this modern Infilco installation. Accelator clarification, followed by forced draft aerator, reduces CO_2 content to 5 p.p.m., produces bright, clear, non-corrosive effluent for final filtration.

CLEARER WATER FASTER with exclusive slurry recirculation
SAVE UP TO 80% IN SPACE (with lower construction costs)
SIMPLER OPERATION — mixing, coagulation, clarification and sludge removal all in one unit
FASTER CHEMICAL REACTION • HIGHER RATINGS

INFILCO
BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894

INFILCO INCORPORATED | *Tucson, Arizona*

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

World's Leading Manufacturers of Water Conditioning and Waste-Treating Equipment

Get full details of this month's new products . . . mail your Readers' Service card today.

With extra long life Dixon Paints—

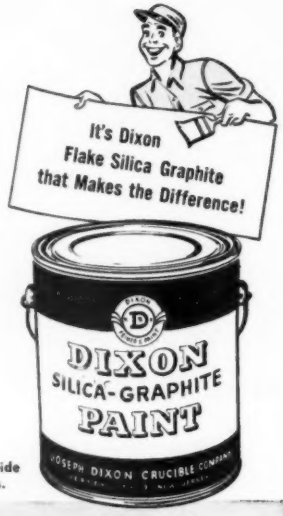
7 to 16 years paint life not unusual!

Service records of 7 years and more are not at all uncommon—under even the most severe conditions—when structures are protected with Dixon *Flake Silica Graphite* Paints.

For instance, Dixon paint stood up *15 years* on a water tank exposed to severe salt water conditions...on a 3½ mile bridge, in a highly concentrated industrial area, it stood up *16 years*... Dixon paint applied 8 years ago to a municipally owned grandstand *is still going strong!*

Why are Dixon Paints so enduring?

Such durability is no accident. It's the flakes of inert *natural* silica graphite forming a tough multilayer film that give Dixon Paints its time-proved ability to protect structures against moisture and severe atmospheric conditions.



Available in a wide range of colors.

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"How to Prepare Your Plant for an Atomic Attack" is a 32-page illustrated booklet covering plant defense organization, shelter and building construction and how to plan for sustained production. Sent on request to Walter Kidde & Co., Inc., Dept. A, 675 Main St., Belleville 9, N. J.

MUSCA DOMESTICA

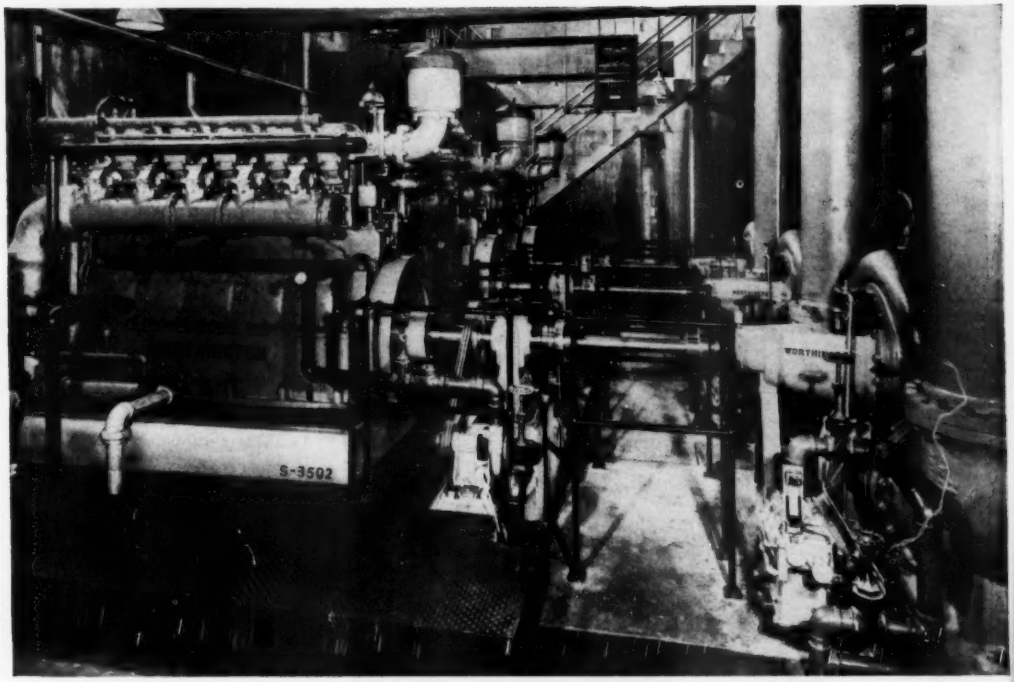
This new book by Luther West, Professor and Head of the Department of Biology, Northern Michigan College of Education, and a former entomologist of the Sanitary Corps, will tell you most of what you conceivably would like to know about the house fly. Control of flies is given proper emphasis. There are 19 chapters, 595 pages, 22 tables and 177 illustrations. Comstock Pub. Co., Ithaca, N. Y. $7.50.

BRUSH & WEED CONTROL

An operation manual by du Pont, this 12-page booklet gives data on methods and results in chemical brush and weed control. It is well illustrated, with before and after pictures, and covers 2,4-D, 2,4,5-T, TCA and ammonium sulfate. Copy free from Grasselli Chemicals, % du Pont, Wilmington, Del.

VIBRATION & SHOCK

"Vibration and Shock Isolation" is a new book by Charles E. Crede, which analyzes the causes of vibration and shock and evaluates the use of the different materials available for isolators. 328 pp. John Wiley & Sons, Inc., New York. $6.50.



Three of seven Worthington 4-cycle gas engines —driving three Worthington 20 mgd recirculation pumps.

Nothing Wasted . . . Maximum Efficiency

AT OKLAHOMA CITY'S MODERN SEWAGE TREATMENT PLANT

The engines that run the pumps are fueled by the gas generated from the sewage sludge.

The rate of gas generated is accelerated by the heat from the engine cooling water.

Even the engine exhaust can be utilized for the digestor heating if necessary.

These are a few of the features of the outstanding new Southside Sewage Treatment Plant at Oklahoma City.

Again—Worthington equipment fitted the special requirements of the job. Worthington had the right engines for the available fuel—in this case, a gas engine was selected because natural gas is available as stand-by fuel.

And again—Worthington furnished not only the engines, but also the pumps . . . four 20 mgd raw sewage pumps and three 20 mgd recirculation pumps . . . in addition to such other equipment as air compressors.

Worthington is an important factor in sewage treatment and a predominant choice for modern plants because it offers such a broad range of equipment: engines for any available fuel, plus the world's most complete line of pumps, comminutors, air compressors, water treating equipment, motors and power transmission equipment. One manufacturer, one responsibility.

For *more worth in Worthington*, call on our nearest office, or write to Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

WORTHINGTON

E.1.8

ECONOMICAL CONTINUOUS POWER
Diesel Engines, 150 to 2,640 hp . . .
Gas Engines, 190 to 2,880 hp . . .
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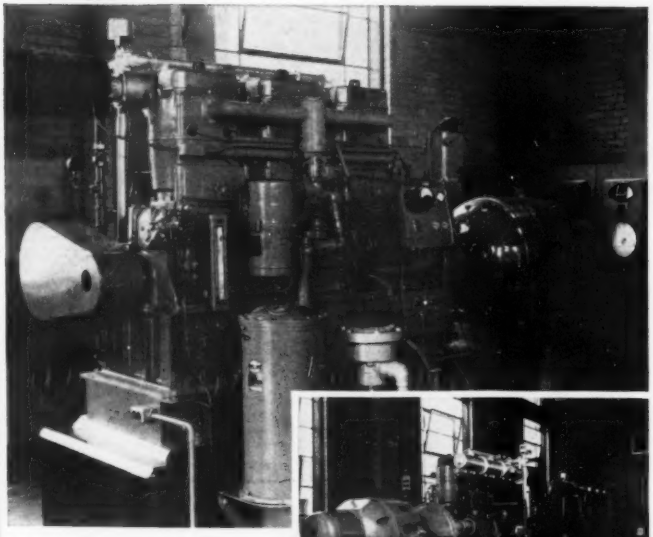

Two 90 H.P. Climax Blue Streak Sewage Gas Engines Direct Connected to 60 KW Generators for Operation in Parallel.

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Proof of Climax quality products is that these engines are installed in hundreds of sewage treatment plants. Some of these engines have been in continuous service over 15 years, with a minimum of operating and maintenance expense. Sewage gas engines are available in sizes from 40 to 250 H.P. Gas, gasoline or Butane engines for emergency use are available in sizes up to 600 H.P.

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MOTOR TRUCKS AND ROADS

This is a 113-page bulletin of the Bureau of Public Roads covering effects of size and weights of vehicles on design and traffic capacity of highways; axle loading and its effect; effect on bridges; and highway-user tax payments in relation to highway revenues and expenditures. Sup't. of Documents, Gov't. Printing Office, Washington 25, D. C., 30 cents.

LEADERS IN THE PUBLIC WORKS FIELD

Milton Rosen has been Commissioner of Public Works of St. Paul, Minnesota, since 1930, except for the periods 1946-48 and 1936-38. In St. Paul, this is an elective job. Under him, as commissioner, are the Bureau of Engineers, which handles all engineering work for the city; the Bureau of Construction and Repairs, responsible for grading, paving, sewerage, etc.; the Bureau of Bridges; the Bureau of Sanitation; the Bureau of General Administration; and the Bureau of Correction.

As president of the American Public Works Association, Mr. Rosen will preside at the Detroit meetings. In addition to the APWA, he is a member of AWWA and ARBA and immediate past President of the Minnesota Good Roads Association, and he has been active in many other organizations.

He was born in Chicago, his family moving to St. Paul in 1906. Since 1915, he has owned and operated his own company, the Milton Rosen Tire and Rubber Co., and has distributed U. S. tires and Willard batteries. Mrs. Rosen, the former Catharine Geer, until recently was an executive of the Carson-Pirie-Scott Co. Mr. Rosen's special hobbies are golf and fishing, but he is interested in all sports.

The picture shows him at his desk, ready to work. Behind him are shown on the map the proposed highway improvements for St. Paul, based on studies of the Department of Public Works and the Minnesota Department of Highways.

(ADVERTISEMENT)

Here are the Answers About Automatic Food Waste Disposers

A collection of discoveries relating to municipal experience with this appliance

THE unquestioned fact that stale garbage has a tremendous amount to do with the control of rats and flies, and the cost of municipal service, makes discussion of automatic food waste disposers mandatory for city sanitation engineers.

How advisable are they, relative to other methods of garbage elimination? How foolproof are they? How do they affect sewage load? What does the public think of them? How do they contribute to really effective control of disease?

Discouraging flies

In stale garbage, fly larvae (or maggots) grow to full maturity *from freshly laid eggs* in as little as 3½ days—which is the average interval between garbage collections in American towns! No wonder a government official called garbage collections the chief obstacle to effective fly control. And flies are disease carriers—spread both dysentery and typhoid.

Rats at Work

Stale garbage is as much a feeding place for rats as for flies. And rats destroy nearly 3 billion dollars' worth of goods a year; have caused more deaths than all the wars in history. They carry bubonic plague, typhus, infectious jaundice, tularemia, ratbite fever.

If garbage is to be collected, it must be oftener than at present if flies are to be controlled; and almost ironclad containers will be musts to discourage the prolific and deadly rat.

Garbage Eliminated at the Source

Even apart from the unpleasantness of handling stale garbage, these factors indicate that the time to get rid of food waste is before it becomes stale, before it must be *stored* within reach of flies or rats. Such a view led the Superintendent of Building and Safety of a large Michigan city to call garbage grinders *the only sanitary method of disposing of garbage.*

The effect of garbage-bred pork on the incidence of trichinosis (1,000,000 cases a year) is still more ammunition against other methods.

Cost of Disposal

Other methods include collection and delivery to a central plant; the sanitary fill method; and the garbage farm method. While costs compare well with all but the garbage farm method, this is now considered relatively impracticable. The other two, unlike domestic disposers, depend on labor costs.

Even collection costs, of course, are relative, depending on the number of collections. Adequate collections would be higher than at present, according to the indications above.

According to at least one major survey, domestic disposers are not at all out of line with respect to cost; and the many advantages offered by them make them definitely practical in regard to operating expense.

Effect on Sewers

The total sewage increase is only 2% or 3% in sewers handling domestic sewage. Authorities say this small increase has no adverse effect.

Even particles of high specific gravity, according to some rigorous tests, are no great danger; for present design standards, satisfactory transport of waste is achieved. Where egg shells used in testing tended to deposit, their clogging effect increased the velocity of flow, thus clearing away the deposits.

Grease presents a problem only when hot; however, the practice of throwing hot grease down the drain is not unknown even where disposers are not installed, a matter for public education.

Durability of Disposers

Disposers are unbelievably rugged. In one case, two disposers were kept in operation for a year, and fed refuse equivalent to that from the average family over ten years. Glass, sand, dust, ashes, and nails were also fed in. At the end of the test, the disposers were still running quite satisfactorily, though somewhat slower.

Further Information

For more information, write Mullins Manufacturing Corporation, Warren, Ohio. Mullins Manufacturing Corporation is the world's largest makers of steel kitchens, and a recognized authority on kitchen equipment.

3 WAYS BEST!

The long, service-free life and easy, efficient operation of the Youngstown Kitchens Food Waste Disposer, resulting largely from the three outstanding advantages listed below, will enable you to recommend the improved Youngstown Kitchens Food Waste Disposer with confidence to the people of your community.

1. This improved Disposer is three ways best. It is designed to take food waste continuously—to eliminate the awkward "stop-and-go" feeding which requires interrupted loading of the Disposer when waste quantities are large.

2. The self-reversing motor changes the direction of the water-swirl, too, with each use of the Youngstown Kitchens Food Waste Disposer—assures complete self-flushing action, complete self-cleaning.

3. A special self-reversing motor changes direction of shredder rotation with each use. This puts two complete sets of shredding edges to work alternately, in effect doubling the blade life.

WRITE FOR MORE INFORMATION!

Mail your request to the address at the end of the article on this page. A Youngstown Kitchens specialist will be happy to help.

Youngstown Kitchens

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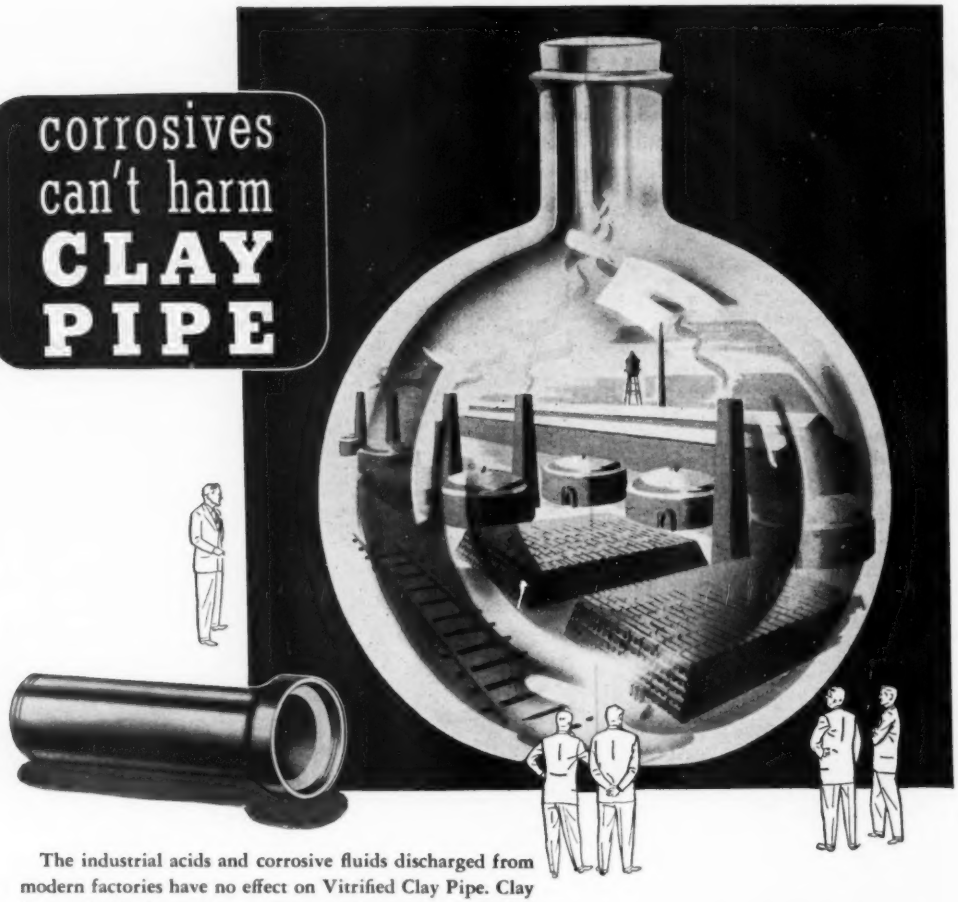
Youngstown Kitchens are sold throughout the World

corrosives can't harm CLAY PIPE



The industrial acids and corrosive fluids discharged from modern factories have no effect on Vitrified Clay Pipe. Clay is completely immune to any form of corrosive chemical activity, whether it's sewer gas, industrial waste, or the destructive acids found in sewage. Today, with chemistry involved in nearly half the nation's total production, it's more important than ever to install sewerage and drainage lines that are chemically inert — proof against the acids and soil conditions of today . . . and of tomorrow. *Every* city of *every* size needs Vitrified Clay Pipe — the *only* pipe that never wears out.

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SPECIFY *Vitrified* **CLAY PIPE**

WRITE FOR DETAILED INFORMATION
Additional information and data on Vitrified Clay Pipe, Wall Coping and Clay Flue Lining sent FREE on request. State your specific questions. Simply contact the regional office nearest you.

C-151-10

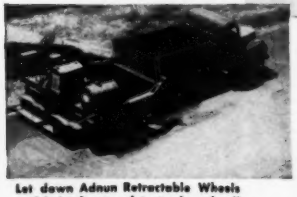
A smooth, safe highway. You couldn't push a quarter under the straight edge on this road.

Joints are tight and positive. Made under pressure and free from hand work they mean safer, high-speed highways, an Adnun exclusive.

Feathering! A job only Adnun can do. Heavy, new shoulder with course blended into the old crown.

Laying heavy stone! Adnuns have laid twice as much stone as is possible with the end-gate, blade method, freeing men and grader for other work.

Twenty-five percent more engine power for handling the heavy trucks.



Let down Adnun Retractable Wheels and hoist front end to truck and roll away. No trailer required!

DON'T BUY a one-purpose BLACK TOP PAVER!

VERSATILITY means money! No other Black Top Paver can handle the variety of work possible with the Adnun! Continuous Course Correction lays smoother roads. Positive overlapping Cutter Bar action makes longitudinal joints under pressure and reduces hand work. Correction of errors is instantaneous and mechanical and adjustments are positive and free from uncertainties caused by temperature, weather or pumping equipment.

The Adnun is the only machine of its kind unreservedly recommended for laying aggregates such as stone, sand, cinder, slag and soil cement.

The Adnun is free from excess mechanisms, it does not have to be continually rebuilt and it can be moved without a trailer at reasonable truck speed.

These advantages mean money in the contractor's pocket, and savings and a better job for the Highway Department. Let us send you the booklet, "11 Basic Things . . .". You'll find it interesting. Just ask!

THE FOOTE COMPANY, INC.
Subsidiary of Blaw-Knox Co.
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Adnun wheel design assures smooth steering without jerks or oversteering. Hand work is reduced and you are free of crawler repairs.

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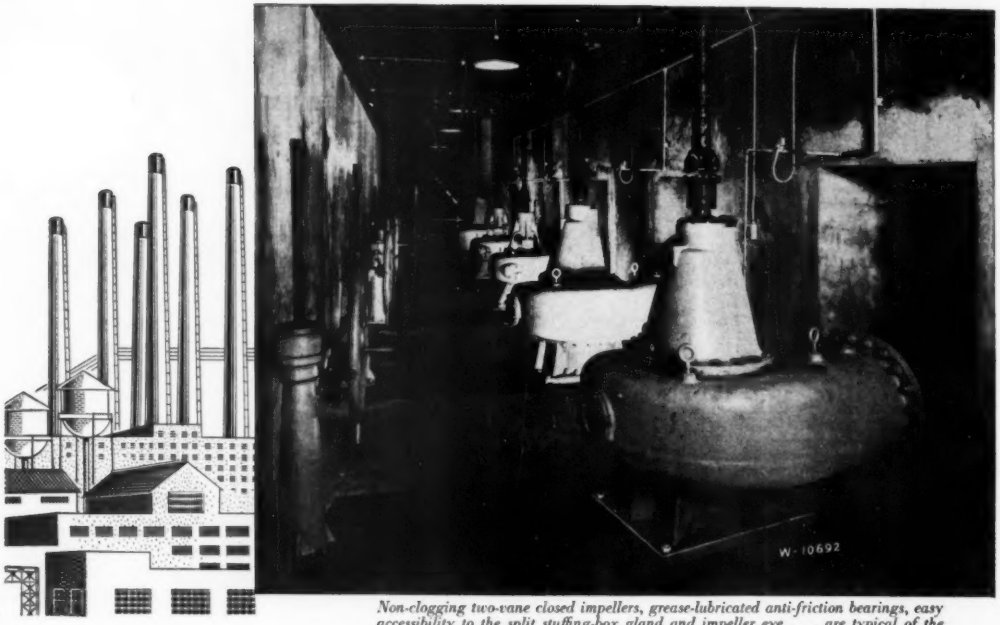


Non-clogging two-vane closed impellers, grease-lubricated anti-friction bearings, easy accessibility to the split stuffing-box gland and impeller eye . . . are typical of the many Worthington MIXFLO *features assuring low-cost, trouble-free sewage pumping.*

How is Bridgeport's Sewage Pumped?

It's full of industrial waste . . . a problem built for Worthington Pumps

Here's another municipality which has turned its sewage pumping over to Worthington—100%.

These five Worthington Vertical MIXFLO sewage pumps are located in Bridgeport's Westside sewage plant—installed in 1946. Three are 20-inch, two are 16-inch MIXFLOS.

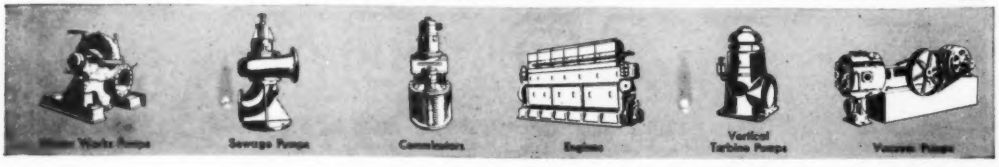
Bridgeport's Eastside plant duplicates these five pumps, and in addition uses two Worthington dry vacuum pumps and a Worthington air compressor.

In many other places, too, Worthington—world's largest manufacturer of pumps—is keeping pace with developments in sewage treatment and disposal by furnishing pumps of utmost dependability.

The Worthington MIXFLO line offers the industry's widest choice of sizes and types. So take a tip from New York, Chicago, Philadelphia, Bridgeport—find out why *there's more worth in Worthington.* Write Worthington Pump and Machinery Corporation, Public Works Division, Harrison, New Jersey.

WORTHINGTON

SEWAGE PUMPS W.3.1



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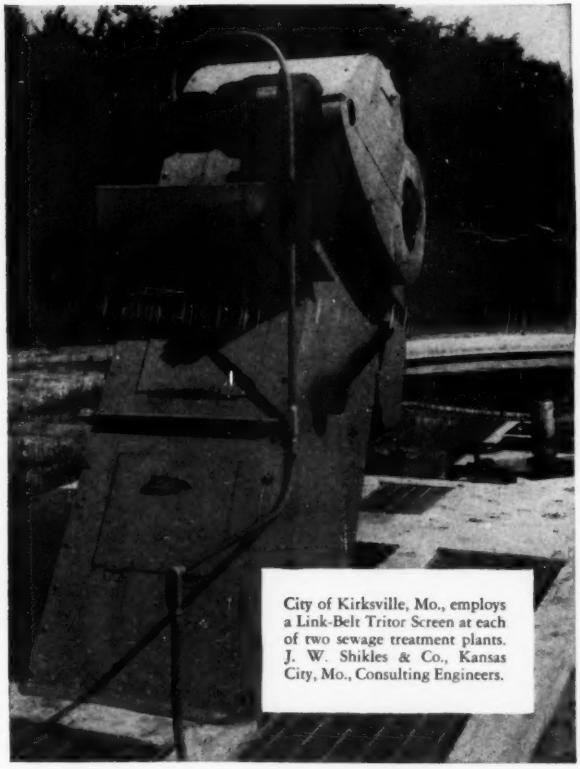
For low flow . . . for storm conditions
TRITOR SCREEN
efficiently removes screenings and grit



City of Kirksville, Mo., employs a Link-Belt Tritor Screen at each of two sewage treatment plants. J. W. Shikles & Co., Kansas City, Mo., Consulting Engineers.

LINK-BELT combines bar screen and grit chamber in one economical unit

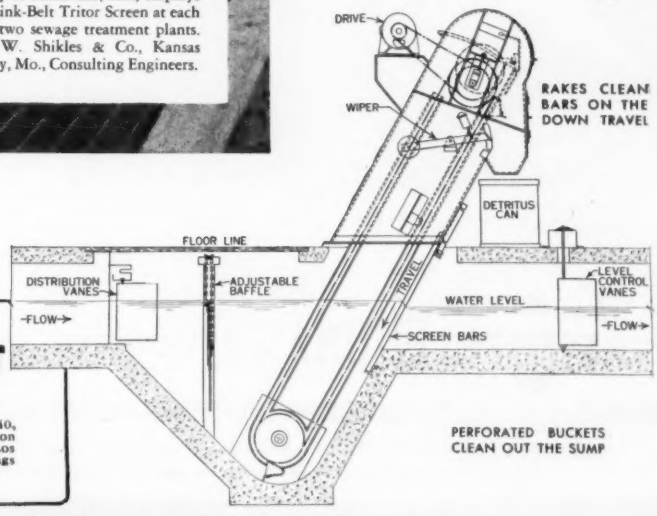
OVER 70 small and medium size treatment plants enjoy the savings provided by the Link-Belt Tritor Screen.

It combines the functions of a mechanically cleaned bar screen and grit chamber in a machine that is economical and easy to install. Used ahead of comminutors or screenings shredders, the Tritor removes large solids to reduce wear on cutting parts. Two adjustable baffles provide velocity control for minimum flows.

When Tritor Screens are installed in conjunction with screenings shredders, screenings may be shredded and returned to the sewage flow during periods of low flows when no grit is coming to the screens.

For details on Tritor Screens and other equipment in the broad Link-Belt line, call the office near you. A Link-Belt sanitary engineer will be glad to give you complete information.

12,427



LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

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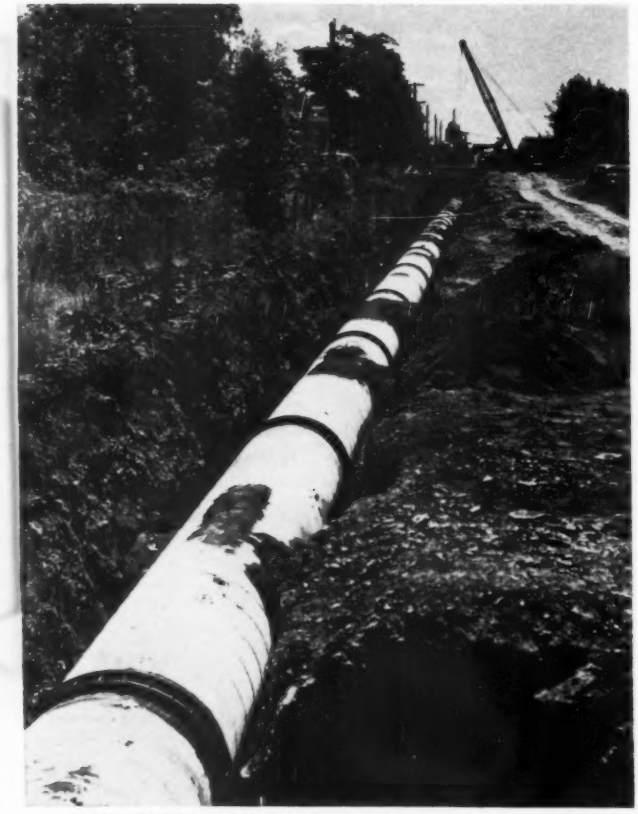
CANADA'S NEW STEEL WATERLINE

. . . all 7 miles

protected by Bitumastic® 70-B Enamel



NEW WATERLINE being laid at Hamilton, Ontario. Contract Department of By-Product Coke Company of Canada, Ltd., is cleaning, lining, coating and wrapping the pipe near the route of the pipe line.

THE 48-inch steel pipe pictured here is part of a 7-mile waterline being laid for the City of Hamilton, Ontario. The steel for the line and the Bitumastic 70-B Enamel were produced in Canada.

On this project, Koppers Canadian subsidiary, By-Product Coke Company of Canada, Ltd., set up a coating yard to line, coat and wrap the 32-foot lengths of pipe with Bitumastic 70-B Primer and Enamel. This yard is adjacent to the pipe-fabricating plant of Hamilton Bridge and Iron Company, Ltd.

The spun lining of Bitumastic 70-B Enamel on the inside of the pipe protects interior surfaces against corrosion and tuberculation. The 70-B Enamel also protects the outside of the pipe against pitting and leakage caused by soil corrosion.

Our Contract Department can handle *your* next water pipe-line project, too. One of our representatives will be glad to discuss the details with you.

Bitumastic Enamels soon available from Koppers new California Plant!

As soon as present construction work is completed, Koppers will be able to supply Bitumastic Enamels from a new plant at Fontana, California. The plant is being built to give you better service in the West.

KOPPERS BITUMASTIC ENAMELS

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KOPPERS COMPANY, INC., Tar Products Division, Dept. 955T Pittsburgh 19, Pa.

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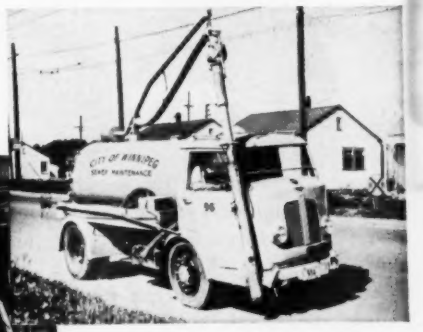
Catch Basin Cleaning Easy and Economical!

This Karrier Catch Basin Cleaner is used by Sanitary Engineering Company, N. Falmouth, Massachusetts for contract cesspool cleaning.

Any municipality that has sewer maintenance problems will agree that the Karrier Catch Basin Cleaner is the answer to their problem for these reasons:

1. Short wheel base for maneuverability; small turning circle.
2. Quiet and slow-running vacuum pump.
3. Hydraulic ram separates solids from dirty water thus increasing the effective capacity of the storage tank.
4. Subdivided tank with compartments for water and sludge.
5. Counterbalanced suction pipe swings to either side or to rear of vehicle.
6. Dirty water can be returned to sewer or used for flushing the next catch basin.
7. Hydraulic ram discharges load from door at the end of the tank when storage space is filled.

Another enthusiastic user of Karrier equipment for sewer maintenance is the City of Vancouver.



Top: For sewer maintenance the City of Winnipeg uses this equipment.

Left: City of Toronto is one of more than 750 municipalities using the Karrier Catch Basin Cleaner.

KARRIER

Catch Basin Cleaner vacuums the dirt out

1951 PUBLIC WORKS CONGRESS and EQUIPMENT SHOW DETROIT, SEPT. 16-19 Visit our Booths B-15 & C-10

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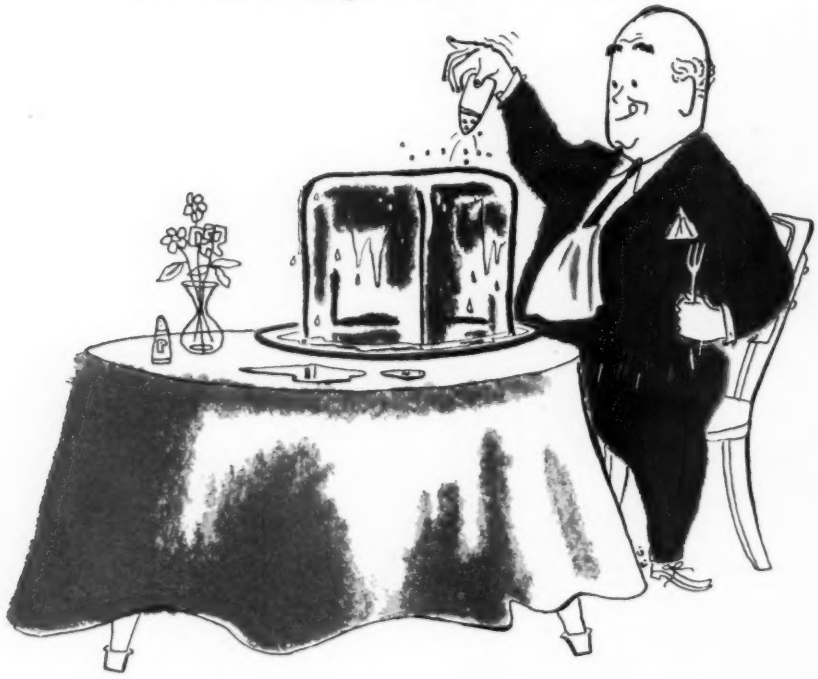
INCORPORATING OVER 30 YEARS OF MECHANICAL CATCH BASIN EXPERIENCE.

Get full details of this month's new products . . . mail your Readers' Service card today.

Do you "Season" your ice ...with salt?



If you use salt alone for ice control on your streets and highways you're solving one problem —safety—but you may be inviting another—corrosion.

Winter-weather worries have lessened for municipal officials since the introduction of BANOX*.

Scores of communities are enjoying the economy and effectiveness of salt—without corrosion—by adding 1 pound of Banox to each 100 pounds of salt.

Addition of Banox to the salt neutralizes the corrosive effects of road slush and brine—reduces the rusting of automobiles as well as municipal equipment and steel structures—ends the motorists' fears and complaints.

If you "season" your ice with salt—complete the job with Banox. Keep your community progressive.

Let us send you full information.

P.S. Don't miss the Banox demonstration at the APWA show in Detroit—Booth B-19.

*T. M. Reg. U. S. Pat. Off.

HAGAN HALL BUROMIN CALGON

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A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.

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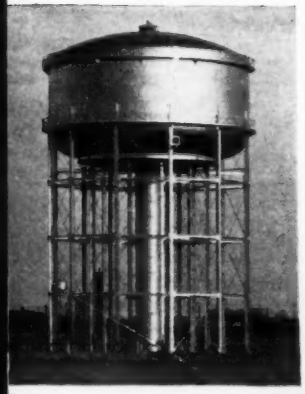
—to serve you on your water storage requirements—

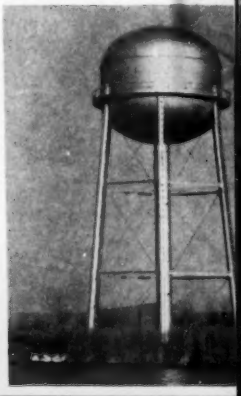
OVER 50 YEARS OF EXPERIENCE IN

Elevated Steel Tank

DESIGN AND CONSTRUCTION

Let us consult with you on your elevated storage tank needs. We will gladly detail the features of our many tank types, and aid in selecting the right design and capacity to fit specific conditions. You can depend on P-DM craftsmanship in fabrication and erection—satisfaction is guaranteed! *Write for free 24-page brochure.*





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Yardley PLASTIC PIPE for water or waste disposal systems

Whatever the need . . . for cold water or corrosive liquids, suction or discharge . . . there's a Yardley Plastic Pipe for the job.

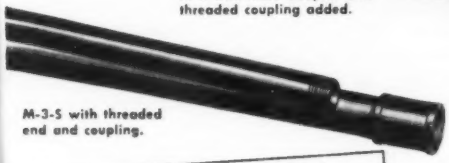
Made from rigid or flexible light-weight material. Acid and alkali resistant. Won't rot, rust or corrode. Produced in a full range of pipe and tubing sizes, ⅛" through 6". Complete line of standard fittings and adapters. Easier to install, more economical to handle.

Send for chemical resistance charts.

M-6 with cement-type sleeve coupling.

M-2 flexible type.

M-6 with male adapter end threaded coupling added.



M-3-S with threaded end and coupling.

YARDLEY PLASTICS CO.
142 Parsons Ave. ADams 9315
Columbus 15, Ohio

YARDLEY M-1 and M-2 FLEXIBLE PIPE SPECIFICATIONS

PIPE SIZE	NOMINAL O. D.	NOMINAL I. D.	CALCULATED B. P. P. S. I.	APPROXIMATE WT. PER FT.	NORMAL SHIPPING LENGTHS
⅛"	.820	.620	540#	.092	400' Coils
¼"	1.080	.840	350#	.141	400' Coils
½"	1.340	1.100	300#	.179	300' Coils
¾"	1.660	1.360	300#	.263	300' Coils
1"	1.900	1.610	300#	.337	250' Coils
1¼"	2.375	2.067	170#	.434	200' Coils
1½"	2.500	2.068	165#	.899	100' Coils
2"	4.500	4.026	150#	1.230	25' Straight
3"	6.625	6.065	115#	2.600	25' Straight

M-6 and M-3-S recommended for working pressures up to 20% of calculated bursting pressures where temperatures do not exceed 125°. For M-1 and M-2 working pressures, use 60% of calculated burst.

YARDLEY M-3-S RIGID PIPE SPECIFICATIONS

PIPE SIZE	APPROXIMATE WT. LBS. PER FOOT	NOMINAL I. D.	NOMINAL O. D.	CALCULATED BURST PRESS. P.S.I. at 90° F.
⅛"	.118	.622	.840	1000
¼"	.161	.824	1.050	900
½"	.212	1.050	1.315	800
¾"	.316	1.380	1.660	700
1"	.378	1.610	1.900	600
1½"	.508	2.070	2.375	500
2"	1.030	3.068	3.500	481
3"	1.470	4.026	4.500	410
4"	2.360	6.065	6.625	330

YARDLEY M-6 RIGID PIPE SPECIFICATIONS

PIPE SIZE	APPROXIMATE WT. PER FT.	NOMINAL I. D.	NOMINAL O. D.	CALCULATED BURST PRESSURE P.S.I. AT 80° F.
⅛"	.053	.476	.600	700
¼"	.080	.715	.833	625
½"	.138	.970	1.140	550
¾"	.20	1.330	1.430	525
1"	.32	1.510	1.730	490
1½"	.45	2.00	2.250	400
2"	.535	3.000	3.250	375
3"	.880	4.000	4.300	342
4"	1.940	6.000	6.440	335

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PUBLIC WORKS Magazine

SEPTEMBER, 1951 VOLUME 82 • NO. 9

SOLVING PUBLIC WORKS PROBLEMS

Pumping Out Hydrants the Easy Way

J. Elliott Hale

Water Superintendent, Waterville, Maine

In pumping out our hydrants, we push a hose into the hydrant barrel and connect the open end of the hose to a 15-gallon drum. This drum is fitted up with a check valve and with a connection to the windshield wiper suction on our truck motor. We start the motor, the windshield wiper suction exhausts the air from the drum, and the water is drawn by suction up out of the hydrant barrel. After the hydrant is pumped out, we drive on to the next hydrant. Meanwhile we open a valve in the drum and empty that, ready for the next job. The connection is controlled so that it is not possible to suck water into the motor of the truck. This device for dewatering hydrants is a very handy gadget and saves lots of time.

CLEANING TWENTY CATCH BASINS A DAY

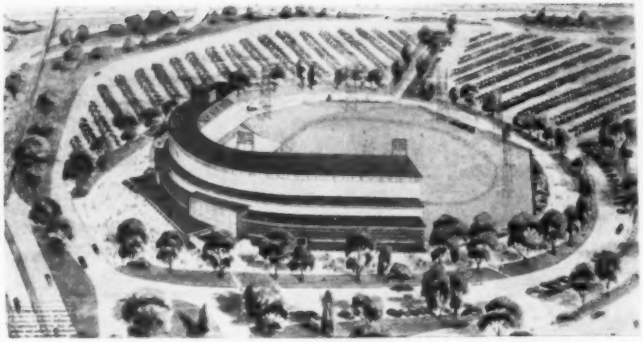
JAMES J. MALONEY

Sup't. of Streets, Milton, Mass.

A catch basin cleaner was purchased somewhat over a year ago. This was a Netco, made by Clark-Wilcox, and we had it mounted on a 1½-ton Ford truck. This machine will clean an average of 20 catch basins a day, requiring, besides the operator, only a dump truck with driver. We have more than 1,620 catch basins in Milton and this machine has cleaned them all, excepting for a few old-style basins.

Many other uses have been found for this machine in addition to cleaning catch basins. We often use the hoist for loading and setting curbing, and in this work it has saved much time and labor. We also use it for loading and unloading heavy drain castings, and we find that it not only saves time but it also prevents accidents which used to occur when these were loaded by hand. We have used it for snow removal in the winter, adding a snow plow to the front. And we have used the air compressor, normally used for operating the hoist, for furnishing air for spraying paint and for running an air gun to drill rock and concrete.

● *CATCH-basin cleaning is only one of many jobs that this Netco unit does for Milton, Mass.*



● *MILWAUKEE County municipal stadium now under construction.*

Milwaukee Starts on New Stadium

JOHN HUBEL

WORK has begun on the new Milwaukee County stadium. For the main foundation about 1,300 piles will be needed and this portion of the work, along with grading, drainage and construction of sanitary sewers has been started. The project will require about 2,600 tons of steel. Fabricating plants have received or have on the way about half of this and "except to be able to get the rest of the steel unless the world situation worsens."

If nothing holds up the work, completion is expected in April. This is a county project because the county has jurisdiction over all parks and playgrounds, even if located in the city. William R. McGovern is chairman of the stadium committee. Grassold & Johnson are the architects and the Osborn Engineering Co., Cleveland, O., are the engineers.

Controlling Water Service in Subdivisions

J. S. GRUTZA,

Sup't. of Water, Aurora, Colo.

In all new development areas, the contractors must extend water mains at their own expense. These must be 6-inch, and they are laid out by the City Water Department. The contractor or developer retains ownership of the mains for five years, during which time any taps made on the line are paid for by the individuals making the taps. Each pays his pro-rata share of the original cost of installation, plus simple interest at 4%.

In an effort to prevent the possibility of excessive tap charges, this office retains a copy of the installation cost and, in fact, collects for the taps and transfers this money to the owner. This procedure not only assists in control, but it also assists in and expedites the sale of the tap, for, if a property owner moved out of town or out of the state it would be almost impossible to bring the interested parties together.

Aurora gets its water supply from the City of Denver through three water lines—one 16-inch and two 12-inch. There are three Empire 6-inch water meters on the 16-inch line and two 6-inch meters on each of the 12-inch lines. We have established, in our distribution system, a minimum size of main—6-inch—and have standardized on Enamelined or thin cement coating with seal coat, class 160, Federal Specification WWP421 pipe. A minimum of one gate valve is placed every two blocks, and a fire hydrant every two blocks, with valve. Since the original installation was not up to this standard, we are now faced with gradual cutting in of valves and tying in of dead ends. This work is being done as funds become available.

Power Saws Save $80 per Tree Removed

R. E. PIPER,

Sup't of Public Works, Manteca, Calif.

AT the present time the city of Manteca is in the midst of an extensive street paving program, including curb, gutter and sidewalk construction on a majority of the streets in the city. Some of this construction requires the removal of trees.

The first few trees removed were felled by cutting the roots, pulling them over with a snatch block and a motor patrol grader, and cutting them into short lengths by hand saw and axe. After removing two large poplar trees by this method, we found that the cost was about $135 per tree, as it required 12 men, two trucks, 1 tractor and 1 grader.

Then a 6-ft. chain saw was rented at $72 per week to complete the job and the remaining trees were removed at a cost of $55.20 per tree. Using this equipment, it required only two men to handle the saw and two trucks to haul. The two men, using the chain saw were able to cut fast enough to keep both trucks busy all of the time and the wood was cut into smaller sections so that it was necessary to use the tractor for loading for only a few butt sections. It was found that a cut which took 38 minutes with a hand cross-cut saw could be done in just about 5 minutes with the chain saw .

If we had had an additional small saw available, this work could have been done at an even lower cost.

Sewer Under Railroad; A Tank for Road Oil

GLYNN MILLS,

City Administrator and Engineer Centralia, Mo.

One of our most interesting problems was the construction of a sewer line under railroad tracks. We used a trenching machine, a maintainer and a 14-inch earth auger for trenching up to the railroad and boring a small tunnel through under the tracks. Then we laid the pipe in this tunnel.

The city purchased a used 8,000-gallon railroad tank car and mounted it on a concrete base on city property, but near a railroad siding. This makes a fine place for us to store the road oil we need for street surfacing and repair work.

● ***THIS is the "Jeep-a-Trench."***

JEEP-A-TRENCH EXPEDITES WATER MAIN WORK

ROBERT CAPPELL,
Manager, Board of Public Works,
Plattsmouth, Nebr.

WHAT we call a "jeep-a-trench" is a chain digger, made here in nearby Auburn, which can be mounted on the back of a jeep or on some tractors. It can dig a trench from 6 ins. to 14 ins. wide and to 6 ft. deep. Our rental costs for digger and operator is 17½ cents a foot for a trench 5 ft. deep, and 4 cents a foot for cover.

The last two summers we laid about 2,000 ft. of B&S 2-inch ci pipe with this digger. The trench was 8 ins. wide and 5 ft. deep. The pipe was laid on timbers placed across the trench and the pipe was assembled on these timbers, the joints poured and, where possible, taps were made and corporation cocks placed. Stakes were driven 5 ft. to one side of the trench (mostly we used old Ford axles), and a rope attached to these was timber-hitched around the pipe. This hitch prevents the pipe from rolling. The double half-hitch was used on the stakes; the ropes were made tight, and then the timbers under the pipe were removed, leaving the pipe held in place with the rope.

By going back and forth and releasing about 6 ins. of the rope each time, three men can put the pipe in place in the trench at much less cost and expense than digging the trench and making the joints with the pipe in place in it.

As our city is very hilly, we have used this jeep digger very advantageously in lowering small water mains. We use the 12-inch wide cutter and we place the machine as close as possible to the pipe. As the trencher proceeds, one man using a bar breaks down the bank over the main, feeding this extra dirt into the machine. It is necessary to place a rope around the pipe about every 15 ft. to keep it from falling into the trench. This work takes four men and is quick and economical.

Remote Controls Work Very Well

H. E. DAELLENBACH,
Sup't., Beaver Water Works, Beaver, Pa.

We have just finished building a new pumping plant with the following equipment: Two Cook deep-well pumps to pump from well to clear well; two Cook pumps (750-gpm with 100 hp motors) to pump from clear well to the distribution system; a Builders-Providence flow meter; two Wallace & Tiernan chlorinators, Type ASV, with differential converter and chlorine flow recorder; and a Brown level gauge hooked to the reservoir and using pneumatic switches to start and stop the pump motors. The outside of the pumping station buildings is brick, with glazed tile inside. We use unit type gas heaters, with fan, to heat the building. In about two years, I think, we will be ready to add a softening plant, and the pumping plant was built with that in mind. The new plant went into operation on Nov. 4, 1950. I might add that, with the Brown gauge, we have been able to hold the reservoir within very close limits. The pumps stop 0.1 ft. below the overflow.

● ***BADGER shovel with special bucket and boom expedites trenching.***

SPECIAL BACKHOE SOLVES TRENCHING PROBLEMS

WILLIAM G. RIDGE
City Engineer, Anoka, Minn.

OUR city has owned and operated an Austin-Western Badger shovel since 1945. In 1948, a new model WD-9 Badger was purchased for street work. The conventional dipper stick was not well adapted to trench excavation, and several types of backhoe buckets did not prove satisfactory in our sandy soil. The City Road and Bridge Department therefore devised and constructed a bucket and boom so that the shovel operates as a pull shovel or trench hoe. Its primary use has been in trenching for sewer and water main construction.

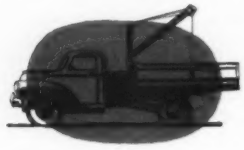
The backhoe boom consists of a 26-ft. dipper stick made up of two members each consisting of a 6-inch channel, a 4 x 6 timber and a 2 x 6 timber. The bucket is one-half of a heavy steel cylindrical tank 4 ft. in length and 3 ft. in diameter, with a reinforced hardened steel cutting edge. The bucket capacity is between ½ and ¾ yard. No changes were made in the power shovel. The dipper stick can be removed and replaced, to permit using the machine for other types of work, in 3 to 4 hours.

With this equipment it has been possible to trench from 300 ft. to 400 ft. during an 8-hr. working day, with depths averaging about 7½ ft. The flexibility permitted by this boom enables the operator to slope the banks of the trench very uniformly to prevent cave-ins in our sandy soil. The 26-ft. length also permits the operator to pile dirt well away from the trench, thus reducing the load at the edge of the trench. We have also found this machine very advantageous for loading peat and heavy soil where only the top several feet are to be removed.

While the photographs show quite clearly the arrangement of the boom, a person actually has to see this equipment in operation to appreciate fully the type and amount of work that can be done by it.

BACKHOE, TRACTOR SHOVEL AND DERRICK SPEED UP WORK AND REDUCE COSTS

THEODORE L. CATE
Sup't., Laconia Water Co.,
Laconia, N. H.



WHEN we are planning to use a backhoe to dig a trench in a congested part of town, we first contact our City Engineer and have him locate all surface drains and sewer connections in the section we plan to dig. We also contact the Public Service and Telephone Companies and have them locate any underground wires which we may have to cross. All gas connections and mains are located by the Gas Company and the location is chalked on the pavement. According to our City Planning program, our location is one-third of the distance out from the property line. We check with our City Engineer and have him give us our location in reference to property lines.

Before the backhoe arrives on the job, we line out several hundred feet of trench and make a chalk line where the outside edge of the tread on the operators side of the backhoe should be to bring our trench in the right location. If it is macadam surface we cut along both edges of the macadam with our air compressor and a wide asphalt chisel. This keeps the macadam from breaking beyond the edge of the trench. If we are working on an extension in a new section where the street is not paved with either macadam or tarvia we scratch a line with a pick instead of using a chalk line. We prefer a backhoe with a caterpillar tread and a bucket about 24 ins. wide. We find that the caterpillar tread machine can go through harder going and can move much larger rocks than a light, truck mounted, machine. We have one man besides the operator with the backhoe to help guide him along the chalk line, check the depth of the trench, and show the operator where the other services are.

What the Backhoe Does

We find that the backhoe is more practical in our section than a trenching machine. In most sections of Laconia there are plenty of big rocks which would stop a trenching machine but can be moved with a backhoe. The backhoe can dig around a large rock and slide it out of the trench even though it might weigh 10 or 12 tons. Rocks larger than that are blasted after the backhoe has done all it can.

We usually drop our dirt at the closest side line of the street, most of it on the sub-lawn, and in some cases we partly cover the sidewalk. This is done to keep as much of the street clear as possible and open to traffic and to allow our derrick truck to get close enough to the trench to lower the pipe into place and hold it while the joint is being yarned.

It is practical to use the backhoe to pick the pipe up from the side line of the street, lower it into place in the trench, and to hold it while the joint is being yarned, if the Department owns the backhoe and has it on the job all of the time. It does not seem practical if equipment is being rented. If the machine is working in an unimproved section it is very easy for the operator to swing a few loads around in front of the backhoe and level up the street or fill up holes.

We find that a backhoe can dig from 300 to 800 feet of trench in a day depending on soil conditions. Hardpan slows the shovel up considerably but a big, rugged, backhoe has no trouble digging in the hardest of hardpan. If we are working in a wet section where surface water level is considerably above pipe line elevation we plan to lay pipe just as close as possible to the backhoe. Usually, if we get the pipe in place immediately after the trench is dug, very little surface water comes in to bother us and there is much less danger of the ditch caving in before the pipe is laid and joint made. We do, of course, occasionally break or pull out a service which has not been properly located for us or possibly not located at all. It is somewhat expensive to repair these broken services but still feel that it is practical to use a backhoe even where there are plenty of other services under the street.

We do not own a backhoe but have a choice of several backhoes owned by contractors in this section. We pay $10 an hour for the tractor mounted backhoe and feel that our work is costing us less than it would to own a machine and probably about one-third of what it would cost to dig by hand.

Tractor Shovel

After the pipe is laid, we bed it with some fine soil and cover it with about 6 ins. of soil, free of rocks. We then flood the trench with fire hose connected to the nearest hydrant and finish filling with the tractor shovel. The operator goes the length of the trench with his shovel raised up about halfway. This way the dirt sifts in and is properly puddled by the water in the trench. After he has made one trip and partly filled a section, he comes back to the beginning and pushes in enough more dirt to fill within one foot of the top of the trench. The rest of the fill is put in dry, and rolled with the tractor after the trench is filled. Usually we get a fairly good job of filling and have little trouble with settlement, when most of the ditch is puddled and dirt sifted in so that it will be thoroughly wet.

It is our custom not to put back any rocks that would require tackle to remove if the trench is ever opened again. Usually we are able to find someone who is looking for these large rocks for fill. Any contractor who has a stone crusher is always glad to haul away any smaller rocks that we have left

(*Continued on page* 91)

HOW TO GET BETTER GRASS FOR THE TAXPAYER

J. W. LENTZ

O. M. Scott & Sons Co., Marysville, O.

GIVING the taxpayers—including you and me—their money's worth seems to be much sought after these days. How this might be accomplished in connection with turfing projects is well worth considering. Today the trend is to surround new hospitals, schools and industrial buildings, sewage and water treatment installations, with larger and better lawns. The reactivation of military airfields and the construction of other new facilities for the mobilization effort is rapidly gaining momentum. All these call for development or renovation of extensive lawn or grass areas.

How to give all this new grass a good start and thereby provide J. Q. Public with more and better turf for his tax dollar is the theme of this article.

Many of the fundamentals recognized as most essential in the preparation of first class lawns on a smaller scale can now be applied to large seed bed preparation. This has been made possible by the development of hydraulically controlled earth moving equipment of a practical size for tractor operation. A list of such tools might include land levelers, light weight road scrapers, back hoes and bulldozers in addition to many of the more common types of cultivating and grading equipment—discs, harrows and drags. With tractor-drawn tools it is possible to move soil if necessary without employing the tremendously heavy machinery like that used in superhighway construction. Correctly grading the soil surface for turf purposes is as important as establishing the proper grade for a road bed. In both cases injury from water erosion to the completed project is held at a bare minimum.

● ***ROUGHLY graded fairway before seedbed preparation.***

Plan the Grade

Even the grading of small roadside parks or neighborhood recreational areas should be preceded by establishing elevations with a transit or other suitable surveying equipment. The services of a qualified engineer are required at this stage of the work.

In bringing the soil up to grade, surface drainage must be kept in mind. Avoid low pockets or extreme slopes where at all possible. Move soils with a high clay content only when relatively dry, otherwise the soil structure will be disturbed and a "puddled" condition will result which makes grass raising particularly difficult.

In addition to adequate surface drainage, which will prevent standing water, sub-surface tile drainage to carry away excessive amounts of rainfall is important. Agricultural tile should be placed at least 20 inches beneath the surface of the final grade. Backfilling the trench to within 8 inches of the surface with gravel or crushed stone will facilitate water movement. A 3-inch fall in 100 lineal feet of tile drain is adequate.

Treating the Surface Soil

As the final grade is developed, the surface, to a depth of 3 or 4 inches, should be loose, yet firm enough to conserve natural moisture essential for the development of young grass. A surface soil too finely pulverized or powdery is to be avoided. If a need is indicated by a soil analysis, lime may be applied to advantage at this point so that the finish grading will work it into the top 2 or 3 inches if possible.

When the surface soil is loose and

● ***DRILLING fertilizer and cultipacking seedbed at same time.***

subject to wind or water erosion, it is well to firm the seed bed after liming and fertilizing. To do this a corrugated roller or cultipacker is suggested. The corrugated effect it leaves may be used to advantage. The cultipacker is operated across the slope. Although broadcast directly on the surface, the seed is saved from being washed or blown away. Moisture and fertilizer are conserved. The need for hand raking is eliminated. The turf development will overcome the ridges first left unless the soil is heavy clay and very wet when the equipment is used.

In the case of one new golf course, more than thirty days passed without rain after seeding the fairways on a cultipacked seed bed. Hot, dry winds swept the hillsides but the corrugated surface held dust and seed loss at a minimum. With the return of adequate moisture, uniform germination resulted. It was felt by all concerned that had these fairways been planted with a soil surface not protected by cultipacked ridges and valleys, the loss of seed during this dry, windy period would have been most serious.

Barren Slopes

In another case of park seeding involving long, barren slopes surrounding a lake, the seeding surface was finished with a cultipacker operated on the contour. The area was neither raked nor rolled after sowing the seed. This planting was followed by rainfall of above average proportions. Sheet erosion and gullying were reduced to a minimum by virtue of the miniature terraces left by the cultipacker.

As the tiny contour furrows retarded rapid water runoff, the soil from the dividing ridges slipped in to cover the seed naturally. The first impression of the germination was that the seed was sprouting in close rows. The rows filled in nicely as the turf developed and a uniform sod resulted in several month's time without replanting or replacing the seed. Otherwise, the seed would have certainly been flooded out by the heavy rains.

Fertilizer Use and Application

The use of a well balanced fertilizer is considered a "must" these days for the success of any turf project large or small. Most state and federal highway specifications include fertilizer. Public officials consider it an essential investment to protect and assure the establishment of new grass in completing the landscaping of our new highways. The same may be said of the CAA specifications for airfield turf preparation.

An application of 400 to 800 pounds per acre is considered the proper amount for a complete and well balanced fertilizer. Farm type fertilizer or lime spreaders will serve to distribute the grass food. Fertilizer and seed drills of the type ordinarily used in agricultural practices can be accurately regulated to apply fertilizer uniformly and economically, placing the material at the proper depth in the seed bed to assure efficient utilization by the young grass.

Drag the area lightly, after drilling in the fertilizer, to smooth the surface. The drag may be pulled just ahead of the cultipacker mentioned previously.

The seed is best broadcast or distributed directly on the surface of the cultipacker ridges. Drilling in the seed with a wheat or oats drill is inadvisable unless the drill may be modified to broadcast the grass seed.

Calibrate the Seeder

There are also farm type lime and fertilizer spreaders that may be accurately calibrated for the distribution of grass seed mixtures. Calibration is accomplished by placing a weighted amount of seed in the hopper, then operating the spreader over a known distance, using a trial setting.

The square footage covered may be calculated by the product of the spreading width and the distance traveled in feet.

Another way is to fasten calibrating pans just beneath the hopper so that the seed is collected as it flows through the hopper. It may be weighed and the amount readily determined without wasting any seed. The area covered is computed in the same way as indicated above. The same methods may be used for calibrating a spreader for lime or fertilizer distribution.

Choice of Seed

In selecting grass and clover seed for any turfing project the following factors should be considered: (1) varieties; (2) proportion of varieties in mixtures; (3) quality; and (4) quantity per acre.

VARIETIES: The kinds of grass and legumes chosen or specified for a certain area depend on the latitude, soil, use to which the area is to be placed, and the time of year for starting the grass.

The planting areas in the southern latitudes, that is below the southern boundaries of Virginia, Kentucky, Missouri, Kansas and Colorado would call for varieties adapted to that area. These might include Bermuda Grass, Lespedeza, Carpet Grass and others of a semi-tropical nature.

North of this line varieties such as Kentucky Bluegrass, Fescues, Ryegrasses, Redtop, White Clover and Bentgrasses are the prevaling types for turf purposes.

MIXTURES: It is always a better practice to plant a blend of grasses and legumes than to depend on a single variety to produce either the quickest or most enduring turf. The proportions of grasses and legumes in such a blend will depend on the location, time of year and purpose for which the turf is intended. For instance, steep embankments naturally require quick-growing varieties with a considerable percentage of vine-type legumes and grasses with tenacious roots to hold the soil from slipping and washing. One important function of a mixture is to provide quick sprouting and growing grasses while the slower germinating types develop into permanent turf.

QUALITY: Of equal importance to the selection of the proper varieties and the proportion of these varieties in any blend is the quality of the seed that make up these mixtures. There is no greater folly than to "economize" by purchasing low quality seed.

The factors that determine quality are the purity, germination and weed seed content of the individual ingredients. The purity is the percentage of the whole seed to inert, such as hulls, dust and stems and dirt.

The germination is the percentage of the pure seed that will sprout to that which for some reason or other will not germinate. In dealing with clover seeds there are always

some that are hard-coated and do not sprout in the allotted time under laboratory conditions. These are considered good plump, live seeds that will eventually grow when exposed to weather and natural conditions. For all practical purposes the number of hard seeds may be added to the percentage of germination and the total considered the growing ability of the clover.

As the weed seed increases, the quality of any mixture decreases, as might be expected. Even a 1% weed content means that under normal planting rates over 2500 weed seeds are being scattered on an area of only 10 x 20 feet.

The question might well be asked, "Why is there no 100% pure seed available?" To clean up grass seed to absolute purity would be more costly than worth while. The loss of good seed in cleaning out the final percentage of chaff and inert matter makes the process inefficient, thereby adding excessively to the price of the final product. Some project officials prefer to express the quality of the seed mixture in terms of the total "Pure Live Seed". For any one ingredient in a mixture the PLS is the product of multiplying its percentage purity by the percentage germination. This is the percentage of the total mixture that will actually produce growing plants. A total PLS of 70% to 75% is considered within the tolerance of specifications set up in most CAA contracts.

So long as the total PLS meets the specifications, the purity and germination of the several ingredients may vary widely. The low quality of one ingredient may be counterbalanced by the high quality of another.

Seed Needed

QUANTITY OF SEED PER ACRE: Whether 75 pounds or 150 pounds of a seed mixture is planted per acre on a new seed bed depends on several factors. A fertile or well fertilized soil can support a larger number of grass plants per square foot than one of low nutrient value. A good rule to follow is "do not plant more grass seed than the soil is capable of supporting."

When good germinating, high quality seed is chosen, not as many pounds are needed. In low quality seed, perhaps as much as 30 pounds in every 100 are incapable of producing grass plants.

The speed at which the new turf may be expected to develop is another factor influencing the amount of seed to sow per acre. A heavier planting naturally increases the number of fast germinating varieties and will provide apparently quicker results. However, unless supplied with an ample amount of nourishment through the use of fertilizer, a particularly heavy seeding may get started quickly but thin out rapidly. In such a case, which is not uncommon, there are simply more grass plants per square inch than the soil is capable of supporting—in the long pull defeating the purpose of the extra expenditure for an early start.

The size of the individual seeds is another thing to consider in deciding on a planting rate. Some varieties are most tiny—one pound containing 5 to 8 million seeds. Redtop and Bentgrass are an example of this high seed count per pound. Bluegrass has 2½ million seeds per pound. Mixtures containing 20% to 30% of these need not be planted heavier than 100 to 150 lbs. per acre. Such a rate insures quick development and this sturdy turf, once established, is capable of supporting heavy use. Other varieties such as the Ryegrasses and Fescues, have seeds five or six times larger and must necessarily be planted at a heavier rate, possibly between 200 and 250 pounds per acre for a good, thick turf in a minimum period of time.

Mulching

On very steep slopes subject to more serious water erosion, such as backfills along roadway cuts and embankments and dikes usually needed at water and sewage plants, a light mulch of clean straw is recommended as a practical aid to the situation.

In addition to protecting the seed bed from critical washing, such a mulch will conserve moisture during dry spells while the turf is getting started. In addition, a light mulch will reduce weed competition because most weed seeds in the soil require direct sunlight to sprout. Straw which is loosely scattered only an inch or so in thickness will provide much more protection than might be expected. Heavier mulching is to be avoided for the quickest, healthiest grass.

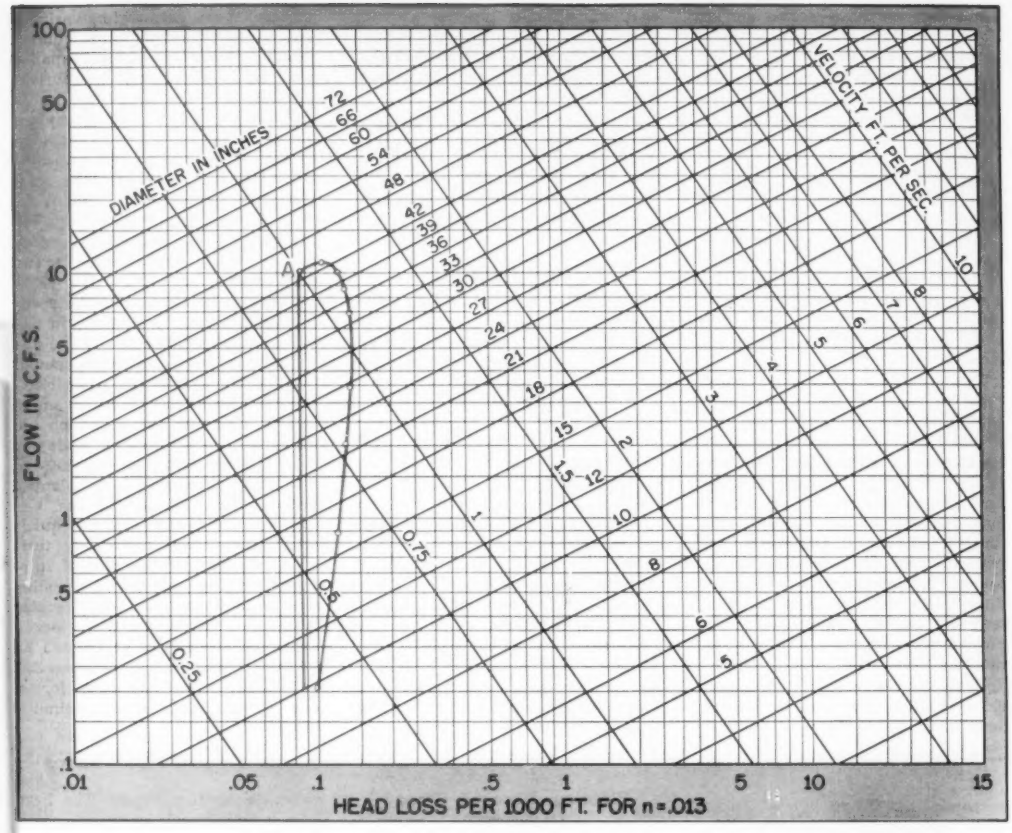
Planting Time of Great Importance

Grass may be started on two areas side by side. One may be successful from the start while the other may show an early need for revamping. All factors except the date of planting may have been as nearly alike as it is humanly possible to have them. The one exception, date of planting, may account for all the difference. Even if the two planting dates are only separated by a week or so, a vast difference in the final results may occur.

There are a few brief periods every year when the odds are against a successful start for a newly seeded area. These are late June, July and early August in most sections of the country. So often seeding of large turf areas is attempted during one of these less favorable times with poor results. Fate or lack of foresight may be at fault. Where a sizeable investment is involved from either public or private funds, it would seem in order to schedule completion of grading and seed bed preparation in advance of the most favorable seeding period. The best time in most localities is just prior to a period when moderately warm temperatures are expected and the natural moisture conditions are improved by frequent light rains. Because of the problem of watering or irrigating large expanses of lawns, it is doubly important to sow seed when natural moisture conditions are most favorable. Periods to be avoided are seasons of extreme heat and excessively dry weather.

From a most practical viewpoint a late summer or early September planting date will provide more ideal conditions for a successful lawn start than any other season.

Conditions that are most always present in early fall are: (1) warm soil—easy to move and grade; (2) warm days and cool nights, ideal for grass seed germination; (3) suitable rainfall and heavy dews, with good soil moisture; (4) reduced weed activity, and more moisture and food for the grass; and (5) a long growing season with plenty of time for the grass to develop.



SLIDING CURVE Quickly

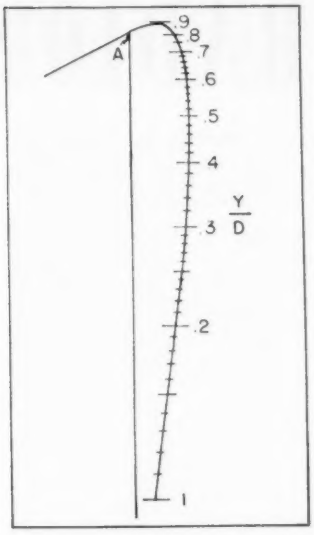
Solves Partly Full Pipe Problems

H. J. MILES
Professor of Civil Engineering
A & M College of Texas

A TYPICAL network chart, such as is shown in Fig. 1, can be used only for the solution of hydraulic problems where the pipes are flowing full. However, by the use of a simple curve, Fig. 2, drawn on rigid transparent material and superimposed on Fig. 1, it is possible to solve, in a much shorter time and by direct reading, problems involving pipes flowing partly full.

Fig. 2 is constructed directly on Fig. 1, as follows: Select any convenient value of Q_f and V_f, the discharge and velocity, respectively, of a pipe flowing full, but not under pressure. By using a table of hydraulic elements, compute the values of Q and V corresponding to various depths, y, of flow in the pipe. Using the Q and V scales of Fig. 1 as coordinates, plot these points, labeling them with corresponding values of y/D. The curve connecting these points is the Q-V curve, Fig. 2.

For example, assume $Q_f = 10$ cfs and $V_f = 1$ foot per second. Compute (or read from a suitable chart) the corresponding values for Q and V for depths of flow ranging from 0.10 full to full. Plot these values of Q and V on Fig. 1 as shown by the small circles in color. The curve connecting these points, also shown in color, with its index point at A, where $Q = 10$ and $V = 1$, is the Q-V curve. Regardless of what values are used for Q_f and V_f, the resulting curve will always be the same, though its position on Fig. 1 will, of course, vary, since the point A is determined by the choice of



● ***FIG. 2, the Q-V curve. On the opposite page is Fig. 1.***

values for Q_r and V_r. This curve can be used only in connection with the chart on which it was constructed.

After the curve has been constructed, it is traced on some rigid transparent material. The following examples show how it is used.

Illustrative Examples

Example 1.—Problem: Given d = 24 ins; s = 0.005 and y/D = 0.6, compute Q and V. Solution: Place the index point A of Fig. 2, the Q-V curve, over the intersection of d = 24 ins and s = 0.005. Read the answer directly: Q = 10.8 cfs and V = 5.5 fs. Any other value for y/D can be read directly without moving the overlay.

Example 2.—Problem: Given d = 16 ins.; Q = 3 cfs; and any one of V, S or y/D, compute the other two. Solution: Slide the curve, Fig. 2, back and forth, always keeping the index point A on the 16-inch line. The various combinations of V, s and y/D to give 3 cfs can be read directly. In the diagram shown, a slope of 0.030 was selected and for y/D = 0.32, V is 7.6 fs.

Example 3.—Given V = 3 mfs; Q = 8 cfs, and any one of y/D, s and d, compute the other two. Solution: Locate the intersection of V = 3 and Q = 8. Keeping this point on the curved line of Fig. 2, move the Q-V curve so as to obtain the various combinations of s, d and y/D that will produce the desired result. The diagram shows the required flow and velocity are obtained with s = 0.0012, with a 36-in. pipe when y/D = 0.41. There are, of course, many other solutions also.

Example 4.—Given Q = 6 cfs and s = 0.010, and any one of d, y/D and V, compute the other values. Solution: Slide Fig. 2, the Q-V curve, up and down, always keeping its straight line vertical on the line representing s = 0.010, to obtain various combinations of the other factors. In the diagram shown, a 16-in. pipe, flowing 2/3 full will have a velocity of 6.1 fs and will deliver 6 cfs.

As already stated, the Q-V curve can be used only in connection with the chart on which it was constructed. However, by the process outlined, similar curves can be constructed for pipes or open channels of any geometrical cross-section and any of the usual pipe or open channel flow formulas can be used.

Other Uses of Fig. 1

The use of the "n" scale on Fig. 1 is illustrated in the following example:

Example 5.—Given Q = 2 cfs and d = 24 ins., to determine the value of the head loss when n = 0.011 and 0.015 respectively. Solution: Refer to Fig. 1. For n = 0.011, enter the chart on the left edge at Q = 2, proceed horizontally to d = 24, drop vertically to the heavy horizontal line representing n = 0.013, thence down to the left, parallel to the guide lines, which are on a 1 on 2 slope, to the horizontal line marked n = 0.011, and thence vertically down to read the required head, 0.056 ft. per 1,000 ft. of pipeline.

For n = 0.015, proceed as before until the horizontal line marked n = 0.013 is reached, thence up to the right parallel to the guide lines, to the horizontal line marked n = 0.015, then drop vertically down to read the head required, 0.105 ft. per 1,000 ft. of pipe. Dotted lines on Fig. 1 indicate these procedures.

In Fig. 1, the dashed line marked "V" is the locus of points where V = Q. It is obtained by connecting several points where velocity lines intersect numerically equal discharge lines, for example, where V = 1 intersects Q = 1, etc. The V-line is the velocity interpolation line and it permits more accurate reading of velocity. In Fig. 1, the dashed line $V^2/2g$ is the locus of points where Q = 10 $V^2/2g$. It is obtained by connecting several points where velocity lines intersect lines representing values of discharge numerically ten times as great as the corresponding velocity heads, for example, where V= 8 (or $V^2/2g$ = 1) intersects Q = 10. Its use permits more accurate reading of velocity head. The use of these interpolation lines is illustrated by the following example:

Example 6.—Given Q = 15 cfs and d = 24 ins., compute V and $V^2/2g$. Solution: Refer to Fig. 1. Enter the chart on the left edge at Q = 15, proceed horizontally to d = 24, go parallel to the velocity lines until the V and $V^2/2g$ interpolation lines are crossed. At the intersection with the V interpolation line read V = 4.8 fs on the Q scale, left margin. At the intersection with the $V^2/2g$ interpolation line read $V^2/2g$ = 0.35 on the $V^2/2g$ scale at the right margin.

Detergents and Cess Pools

According to the Environmental Health Center of the Public Health Service at Cincinnati, tests using earth cores and basic water solutions of soaps and detergents showed that five or six cores dosed with detergents finally developed greater rates of percolation than they had originally. The cores to which soap solutions were added continued to decrease in percolating ability throughout the test which was continued for 55 days.

Rating for Sludge Lagoons

The lagoons for digesting raw sludge at Houston, Tex., have been rated at 100 tons of dry solids per acre-foot per year.—Purdue Sanitary Engrg. News.

"Bubble, Bubble, Toil and Trouble"

Detergents in Los Angeles sewage are thought to be responsible, at least partially, for profuse formation of bubbles on the surface of the aeration tanks. An unusual feature was the dispersion of the bubbles over an adjacent community by ocean winds. This was effectively prevented by breaking up the bubbles by streams of water from fire hoses. Presumably this remedy is only tentative until a preventive of bubble formation can be found.

TWO WAY RADIO IN WATER DEPARTMENT OPERATION

● *RADIO in Water Dep't. truck.*

J. E. WILLIAMS
Water Supt., San Angelo, Texas

THE San Angelo Water Department operates three service trucks equipped with two-way radios. Use is made of the Fire Department master station through a remote control box set-up in the Water Department office. Operation is on a frequency of 154 megacycles, as assigned and licensed by the FCC. Federal regulations require a licensed operator on duty at all times the station is in operation. Since such a licensed operator is on duty for the Fire Department and since all equipment used by the Water Department is classed as auxiliary equipment to the master station, it has not been necessary for the Water Department to license those individuals who use the communications equipment.

The accompanying photograph shows a typical installation in a ½-ton Chevrolet truck. The control box is mounted on the instrument panel and contains an off-on switch, volume control, squelch control, transmitter and receiver indicator lights, and a clip bracket for the microphone. The speaker is mounted behind the instrument panel in the space reserved for ordinary radio. The microphone carries a push-to-talk control buttons. The transmitter-receiver unit, approximately 8 ins. by 4 ins. by 12 ins., is located under the seat of this particular truck. The small antennae (not visible) protrude from the cab roof. Each unit is held to the assigned frequency by a tuned crystal. Considerable battery trouble was experienced until special electrical equipment was installed in each of the trucks. Each truck is now equipped with a 6-volt alternator tied into the ignition system through a selenium rectifier. An auxiliary transformer which may be clipped on ahead of the rectifier furnishes enough 110-volt current to operate a ¼-in. drill or two 200-watt lights.

The trucks may communicate with a master station or with each other. The extreme operating limit of the equipment in use is about twelve miles. One truck is assigned to a service man who makes routine connects and disconnects; another to a trouble-shooter; and the third to the construction foreman. It is impossible to estimate in dollars and cents the savings effected in time since the installation of this equipment, but its use during a last-winter's five-day period of freezing weather may serve as an indication of its value. This was one of the worst freezes this country has experienced in several years. We anticipated many frozen pipes, broken meters, etc., and when the thaw began, the three radio equipped trucks were assigned different segments of the city. They, in turn, controlled three other trucks without radio equipment. This network made possible the handling of some 400 trouble calls in three days, sometimes at a rate averaging one every four minutes. Untold property damage was thus prevented.

The fire chief and I feel that the mutual use of one station works to the advantage of both departments. They learn of bad water breaks or damaged fire hydrants which might hamper their operation if a fire should start in that area. Our department learns of fire calls and can give the fire department immediate assistance if it is needed. The fire department can cut in on us at any time that conditions arise requiring their use of the radio.

RADIO'S

DANIEL E. NOBLE
Vice President in Charge of Communications and Electronics Division, Motorola Inc.

RADIO communications will be one of the primary facilities for information flow both at home and at the front should another international conflict occur. During World War II 2-way radio communications grew to tremendous proportions. In a future war it is inevitable that this same type of communications will become a vital cog in civil defense, in addition to its indispensable importance in the military picture. Many authorities feel sure that war now would bring bombing, shelling, and sabotage markedly closer to our homes and factories. As a result, civil defense activities must take a position far in advance of any home defense system previously conceived. Already the wheels are moving toward the integration of an efficient civil defense system.

In a Department of Defense booklet "Principles of Plant Protection", dated August 1, 1950, it is stated: "Normal communications will undoubtedly fail under attack. Telephone lines will be broken and all power may be off. Accordingly an emergency system must be designed to provide for this eventuality. Radio transmission of orders or messenger services are possibilities."

Radio is one means of communications that penetrates through walls and across distance without wires, and without delay. In these virtues lies its strength, value, and dependability. The threat of war emphasizes the importance of these features of radio. Not everything about a future war is unforeseeable; but we can be sure that telephone lines will be broken, and that sources of power will be cut off.

Civilian Protection

All civilian 2-way radios will, at times, have to be used to aid in case of disaster. Radios in police and fire trucks and cars are used today continuously for such occasions on a more minor scale. In case of major catastrophe, as enemy bombing, other radio units will also have to be used. Two-way radios in trucks, taxis, and any other vehicles will be called into service to coordinate

Place in CIVIL DEFENSE

● ***PLANT protection officer at Eastman Kodak uses 2-way radio.***

activities and get medical supplies, food, and other necessities to places where they are needed. All who own and operate F.M. 2-way radios will realize that ownership carries a moral responsibility to use such equipment whenever and wherever it is required in emergencies.

Portable units, "handie-talkie" radiophones and Pack Sets, will be vital in case of disaster, to be carried where vehicles can't be taken. These portable sets can be hand-carried into burning and bombed-out buildings and through rubble, and can be used to communicate for aid.

Rapidity, coordination and thorough training are aspects that will contribute heavily to saving lives. That means those persons who operate 2-way radios continuously, those who operate them by habit, are the ones who must be available in case of emergency. It is the thoroughly trained persons who will be able to handle such equipment under pressure of enemy attack, who will be able to act courageously and without hesitation.

Destruction of manufacturing plants will be the goal of bombing and sabotage. Plants making military goods will be of primary importance, but the crippling of any factory engaged in either war or civilian production will be advantageous to an enemy.

Wire communications, wrapping a modern industrial plant like a web of copper rope, under normal conditions facilitate dissemination of orders and information that allow continuous and expanding operation. Such communication systems aid in message transactions within the plant, from office to office, building to building. Many exchanges of information are made between nearby plants or between companies within a few miles of each other. All this is normal peacetime operation.

In wartime, however, communications are even more vital, for not only are operation, salaries, and profits of business firms dependent on the availability of instantaneous information exchange, but even the lives of our soldiers in combat and the future of our entire nation are involved. Yet wire communication lines are to enemy agents an invitation to act. One snip by a pair of pliers and the line and its vital communications are gone. One loosened connection can shut out information lines that today blanket an industrial plant. Along with internal communications would go outside lines.

Successful enemy bombing, furthermore, which results in many broken wires and cables will leave a plant in the same prostrate position. As a result, one of the most important links in production is probably the weakest, for these veins that wrap modern production plants can be easily severed, leaving the plants uncoordinated and incoherent.

Plant communications systems designed to use telephone only and without recourse to standby equipment, cannot contribute their fullest measure to winning a war because of inherent vulnerability. Communications within a modern plant spreading over many acres of land must be almost completely uninterrupted. Production can be restored after a breakdown of plant machinery only by getting repair equipment and men to the scene immediately.

By integrating an F.M. 2-way radio system into a plant's communications system, added assurance is produced that when telephone lines break or are shorted, whether by war, sabotage, or accident, vital information can continue flowing through major operation centers. No foreign agent can cut the ether that carries radio messages. Amputation of any transmitting and receiving point on a 2-way radio system as a result of damage has no effect on the rest of the system. Instant communications remain available between any remaining two points or between the control point to all other F.M. 2-way radios in the area that are on the same frequency.

Editor's Note: While the above data refer primarily to industrial plants, they apply in full force also to water supply and purification plants, street clearance and repair and waste disposal. In addition, an important function of a civil defense organization is planning to assure a quick return to near normal industrial plant production and living conditions. In this, we believe radio communication is an essential. For it to operate effectively, standby power may be required at major operational centers.

PROGRESS REPORT on

Guy Browning Arthur

AT ABOUT the halfway point in the construction of the San Antonio Expressways this much has been accomplished: The section connecting U. S. Routes #87 and #81, from the Fredericksburg Road to Martin Street, 2.12 miles, built at a cost of $5,558,600; two frontage streets reconstructed through the business area, 0.872 mile, costing $351,600; spur connections to structures, 2.4 miles, total cost $778,000.

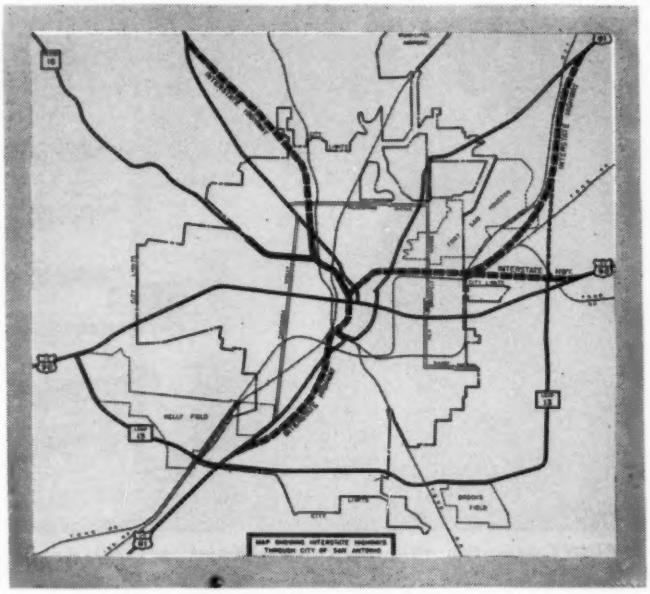
Thus $6,688,200 has been spent for construction out of an estimated total for the project of $14,322,000. To this must be added the cost of rights-of-way. They are purchased by the city of San Antonio with the proceeds of bonds issued for the purpose. This amounts to about one-fifth of the total. Engineering and construction expenditures are from state funds, with Federal Aid.

This huge project has been discussed for years. San Antonio is a location which will develop valuable information on routing highways through or around cities. Two transcontinental routes cross here: U. S. #81 from Canada to Mexico, and U. S. #90 spanning the country from ocean to ocean.

The Broad Considerations

No city can now rely on its own research and engineering talent to solve its traffic problem, especially if its streets must carry a heavy concentration of cars and trucks traveling to and from remote points. It may be said that, in a cross-roads city like San Antonio, the main streets belong to the 34,000-mile system of national highways, which carry 20% of all street and highway traffic.

So San Antonio nationalized its problem by originating the San Antonio Urban Expressway project, basing its action on the Federal Aid Highway Act of 1944, which provides for the use of Federal Aid on city trafficways. All arrangements were made with the Texas Highway Department in 1945. A special engineering organization was established in the city, headed by J. L. Dickson, Engineer-Manager, to supervise all construction.



● ***Completed and proposed sections of expressway as of 1949.***

Metropolitan areas are now the bottle-necks in transportation. Until recent years it was thought that our main need was through roads in some articulated system. The cities were supposed to take care of themselves. Looking back over ten years it is plain that the cities did not possess the magic or necromancy needed to get this cross-country traffic load through their busy streets. The problem became so clouded with conflicting interpretations of omens and statistics that even the planning of adequate city thoroughfares grew into a staggering task.

Few cities have been able to lay out their streets since the coming of the automobile. The pattern had been laid down for generations in most places. It was for horse-drawn vehicles. And it was for a leisurely traffic tempo.

Problems of the Cities

So the provision of through-city routes with sufficient capacity for the flood of out-of-town vehicles means virtually tearing the business section down and starting over with four-lane streets. Some cities have done this heroically. It remains impossible to do it in others. In Baltimore, for a good example, where a car crossing the city on U. S. #1 must stop at about 21 traffic lights, in narrow streets cluttered with street cars and buses, such a solution is out of the question. The alternative is to build by-pass highways around such cities—or build city-line traffic circles to cross all roads and arterial streets.

The statement used in the San Antonio Expressway literature that 85% to 90% of the travelers on main highways want to come into metropolitan areas may be questioned. The correlative statement that these travelers wish to by-pass small communities must also be aired in any study of methods. Many seasoned motorists prefer to stop in small places, and go into the big cities only by necessity, especially if they are driving on business.

A dependent question must then be considered: How much can a community influence the wishes of the fast-traveling motorist in the way it builds its highway connections? And—how much does it wish to?

The problem does not remain ab-

San Antonio Expressway

stract for a city like San Antonio, with its mild climate and intriguing atmosphere. All normal considerations must be modified by its desire to attract the vacationing motorist. It is an important business center, but it is also a winter resort looking for more tourist trade.

Formerly every city, and perhaps the smaller ones in particular, objected to by-pass highways. Merchants held that tourists bring enough business to warrant routing them through the main streets. More and more places now see the fallacy of that view. They find that the cost to the community—the extra up-keep of pavements, traffic signs and control, and police protection—is not paid off by the patronage of tourists. So in many sections the trend is now toward bypassing the highways.

But in San Antonio we are past the theorizing stage. We have the concrete decision to carry the highways right through the city with this ambitious system of expressways. For any large city to set up such a plan, knowing beforehand what the cost will be, and how the load of traffic will increase from now on, is to demonstrate rare courage and confidence.

Helps to Move Traffic

Every modern device is provided in these super-highways for the expeditious movement of traffic with maximum freedom and safety. Freeway lanes are separated by median strips. Cross traffic goes over or under. Points of entrance and exit are designed to reduce traffic conflict to a minimum. Special turnout lanes are built for buses. The expressways are lighted with a modern mercury vapor system.

One important pedestrian crossing at French Place, to serve the schools and churches in that area, is a three-hinged steel and concrete span over the freeways. Another at Elmira Street, for the business district there, goes over one lane on a steel and concrete span, and then under the other lane.

The usual regulations for such highways are in force, such as no-parking on the freeways. Good sodded shoulders are maintained, and emergency parking must be outside the curb.

It is well known that any city traffic problem is inseparable from

Photo by Jack Amman

● ***AIR view of completed section of expressway shows same general area as plan on opposite page.***

● ***VIEW looking south, showing under and overpass structures.***

● ***PEDESTRIAN crossing shows dimly in distant background.***

● ***Looking south from Colorado Street, showing undercrossing***

the city's growth in business. An axiom accepted in all recent studies is that a business district can grow only in step with its capacity to absorb the moving traffic and the parked cars of buyers.

San Antonio has chosen a solution that will bring a tremendous volume of traffic right into the downtown business area. Some may contend that a big traffic circle around the city would do the same thing.

Nevertheless every person who debates the alternatives must believe that the competent engineers on this job considered all these aspects of the problem. Undoubtedly they had superior information on the existing conditions, the comparative difficulties and costs of alternative methods, and the predictable traffic load. In a professionally abstract and restrained attitude they will watch the performance of the project with more interest than any layman. They are contributing one of the best examples of modern highway design to be found anywhere, and one with few unusual conditions to make it difficult to evaluate.

An impressive array of talent has been employed in the planning, design, and construction of the project. Mr. Dickson has had, of course, the help of the Texas Highway Department, and through that body the assistance of the State Highway Commission and the U. S. Bureau of Public Roads. In his staff he has R. A. Bossy as Supervising Urban Engineer; R. O. Lytton and R. G. Kirk as Supervising Construction Engineers; and J. J. Fuller as Supervising Designing Engineer.

The contractors are H. B. Zachry Company; M. B. Killian Company & Killian-House Company; McKenzie Construction Company; and Colglazier & Hoff.

Now under construction is a section just south of the business area connecting with U. S. #81, a distance of 1.43 miles. This is to be finished in 1952. Ahead of that are the 1952-53, and the 1953-54 programs. The whole project should be open in 1955. The freeway lanes in the business area will be the last section of the work. This section will be only 0.87 mile in length, but it will cost $3,500,000 for construction, after the city has spent $1,500,000 for right-of-way.

REFUSE COLLECTION AND DISPOSAL COST AND METHODS

C. E. PERKINS

WITH a population of about 90,000, Winston-Salem, N. C. is a typical Southern city. Industries, such as Reynolds Tobacco Company, P. H. Hanes Knitting Company and numerous others contribute much to the economic life of the community.

In 1947 the citizens voted to amend the city charter to provide for the Aldermanic-City Manager form of government. The writer became the first manager on July 1, 1948.

Almost immediately there came a deluge of complaints about garbage and trash collection. An investigation disclosed a number of reasons for these complaints. For example, trucks were supposed to cover certain streets on a specified day. If bad weather or holidays prevented the collection on that day, the garbage remained uncollected until the next regular collection day. This practice left many areas with less than their two collections per week, and proved highly unsatisfactory.

Improvement in Collection

The collection practices were improved by assigning definite routes to be covered twice each week, and each truck was held responsible for rendering this service, even though longer hours might be required on some days to get back on regular schedule.

All of the trucks in use had open scow-type bodies. Although canvas covers were used as much as possible, the odors, flying paper and unsightliness could not be greatly improved.

Modern closed-type collection bodies had heretofore been considered "too expensive" for use here. A survey of practices in neighboring cities and an analysis of comparative local costs convinced us that we should buy at least one closed-type body for immediate use. This one was followed closely by a second. The first was a 9-cu. yd. capacity packer-type body and the second was a 12-cu. yd. body of the same type. These were used in residential areas. After a year of experience with these trucks and bodies, we purchased two 15-cu. yd. packer-type closed bodies for use in our business areas where trash is particularly bulky. These were later followed by other closed bodies and two more will be purchased during the coming year bringing the fleet of closed trucks up to nine.

It has been our hope that we can eventually replace our eighteen open body trucks with closed ones, although of course the number of closed units required will be considerably less than the present number of open trucks. Just how much reduction can be made in the number of units required is still a matter of debate between salesmen for closed units and the supervisors responsible for collection. It is an established fact that the closed-body packer-type unit, properly manned and routed, has saved us considerable money in collection costs. In addition they do a more sanitary and satisfactory job from the standpoint of both the citizens and the city.

Large Steel Containers

During the past year we have added two trucks with hoisting equipment to pick up, empty and return large individual steel tanks which have been purchased by school cafeterias, hotels, hospitals, department stores, grocery stores, apartment projects and other places having large quantities of garbage or other refuse. The units are ratproof, sightly and far more sanitary than small cans or containers. We believe their use is economical for us and highly satisfactory to the customer. We are encouraging a further expansion of this type service at locations where we consider it advantageous.

Disposal Practices

Winston-Salem has a relatively modern incinerator, and for many years prior to 1949 had incinerated all of its garbage and other refuse. During that year a tractor with bull-lam attachment was purchased and the first sanitary fill was begun. Considerable skepticism ex-

Table I.—Garbage Disposal Costs

Year	Aver. Labor Pay Rate	Tons Collected	Disposal Cost (Total)	Disposal Cost (Per Ton)
1945-46	0.50/Hr.	33,505	26,701	$ 0.80
1946-47	0.60	33,965	31,571	0.93
1947-48	0.70	38,112	36,615	0.96
1948-49	0.75	44,234	45,770	1.03*
1949-50	0.83	49,779	30,246	0.63
1950-51	0.85	57,500	23,049	0.40

*The first sanitary fill was placed into operation during this year.

isted in the minds of some of the men in the Public Works Department as to whether or not the sanitary fill would be satisfactory, whether it could be utilized in wet weather, whether the odors would be a nuisance, and whether there would actually be any saving over previous methods used. Nevertheless they went after the job of making the landfill operate if possible, and very soon they became enthusiastic over the results.

For our first landfill we made it as easy as possible on ourselves by choosing a piece of ground that was dry and adjacent to the incinerator. We kept about half of the collections going to the incinerator and kept it in readiness to receive all collections in the event of trouble. We learned the best techniques by actual experience and we planned for the future by recognizing our mistakes of the past. For example, we soon concluded that our first tractor and bull-clam shovel unit was too light to stand the heavy duty and abuse involved in a landfill operation. Our second unit was more expensive initially but less expensive to maintain.

With the acquisition of the second unit, we became bolder and moved into a site adjacent to a grade school, a college campus and a recreational area. The ground level there was low enough to flood frequently and therefore had never been put to any use whatsoever. It is now being rapidly reclaimed with a deposit of over a hundred tons per day of garbage and trash, and will within a year or so be available to supplement the existing recreational area as a valuable addition thereto. No complaints have ever been received with regard to either appearance or odors, except on one occasion when our operator inadvertently opened up some old fill. This immediately caused a barrage of odor complaints. Correcting this trouble ended the complaints.

We learned another lesson on this fill. Ground water level is fairly near the surface, which means that not enough cover dirt can be secured by the tractor and bull-clam method. A drag-line shovel is the best equipment to use on such a project.

Recently a member of the local Civitan Club gave the club title to a tract of land of 23 acres, which was in turn to be deeded to the city for park purposes. It was the intent that the city drain and reclaim this land by the landfill method, after which the club would equip and develop it as Civitan Park. Preliminary drainage has already been completed. A drag-line shovel will be purchased soon, and the reclamation of this low ground will begin. The site has been a community eye-sore and health-hazard for many years. Within five years it will be an attractive park and valuable recreation area. In the meantime it will provide a short haul for collection trucks in that end of the city.

Costs of Operation

Our experience has proven to us that sanitary fills offer advantages over incineration which include land reclamation benefits, shorter hauls by collection trucks, lower labor costs and much lower overall unit costs. Disadvantages are encountered in wet weather, in the breakdown of operating equipment, and by limitations as to the amount of refuse which can be advantageously received at any one site. Table 1 shows a comparison of overall unit costs per ton of garbage and waste disposal for the past six years.

The total cost figures shown in the table include payroll, operating costs, maintenance and depreciation on landfill equipment, but do not include depreciation on the incinerator. No collection, supervision or administrative costs are included above.

Conclusions . .

We feel that desirable standards and methods in garbage and trash collection and disposal should provide for the following:

1. Collection in closed bodies or individual units.
2. Collection twice weekly in residential areas and daily in business areas.
3. Collection at the customer's back door or yard.
4. Disposal through the most economic satisfactory means, which in many instances will be the landfill method.
5. Disposal in areas where valuable land can be reclaimed and nuisances eliminated.

Since garbage and trash collection is the municipal service that seems to be the most noticed on a day-to-day basis by a majority of the citizens, it seems logical that municipal officials should give very special attention to the planning of the routine of this activity. Clean, well-painted and maintained trucks, dependable collection schedules, careful workmen, well-kept disposal sites, plus letting the public know about the improvements being made, will go a long way toward making Mr. and Mrs. Citizen feel less pain at tax-paying time.

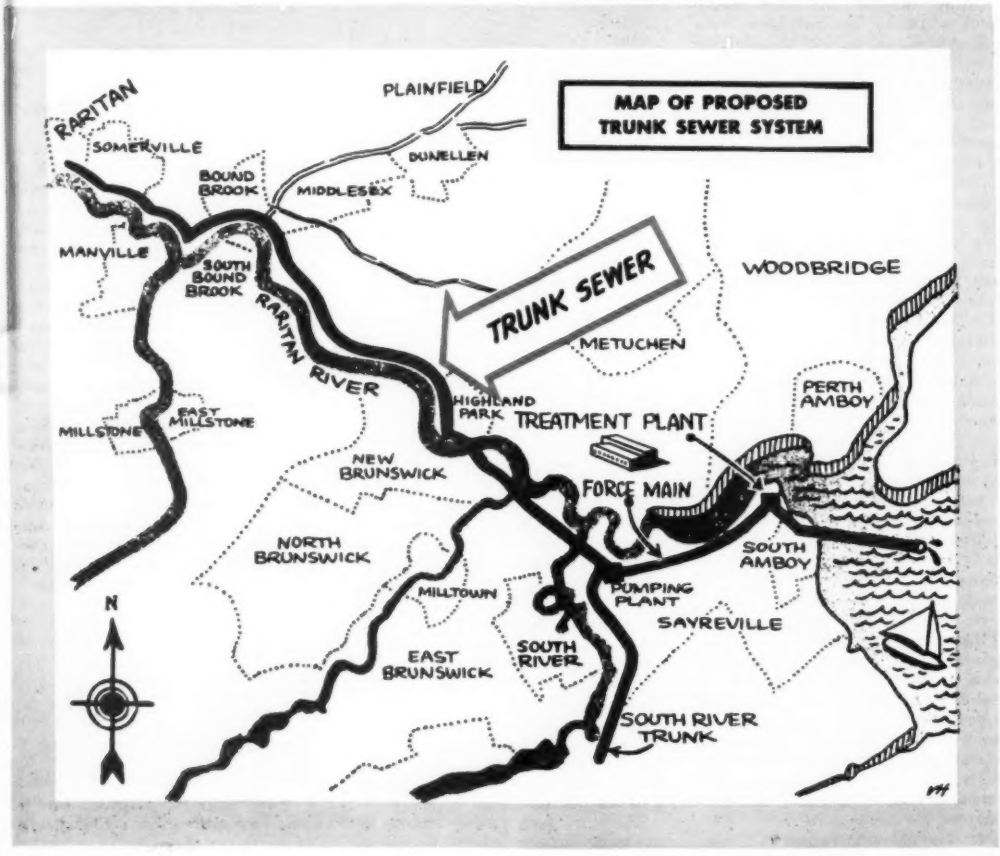
● ***ABOVE, left, disposal under way. Two collection units shown here.***

TRUNK SEWER PROPOSED FOR THE RARITAN RIVER VALLEY

PLANS have been prepared for a trunk sewer to remove from the Raritan River the present extremely heavy load of pollution. This sewer would extend from Somerville to the mouth of the South River, where a pumping plant would be installed to force the sewage to a treatment plant near South Amboy. After treatment, the sewage would be discharged about two miles out in Raritan Bay. The sewer would carry a present volume of 103 mgd of sewage and industrial wastes. Treatment, though classed as primary, is expected to remove about 75% of the organic matter due to the coagulating action of the industrial wastes. Cost of the sewer, which would vary in size from 30-inch at the upper end to 102-inch, and of the treatment plant is estimated at $30,000,000, with annual charges for operation, interest and amortization amounting to $1,400,000. This cost would be allocated on the basis of volume and strength of wastes and would be borne about 65% by industry and 35% by the municipalities in the Raritan Valley.

There are now 24 municipal sewage treatment plants in the valley, while industries have 15 waste treatment plants in operation. Practically all of both municipal and industrial plants are providing inadequate treatment and it is estimated that all of them would have to be enlarged and improved to meet the state standards, and five new plants would have to be built. While the overall initial cost would be less than for the trunk sewer—about $13,000,000—the annual costs would be about 50% greater.

The project is being sponsored by the Middlesex County Sewerage Authority, of which George F. Smith is chairman. Consulting engineers on the work are Elson T. Killam of New York City and Metcalf & Eddy of Boston, Mass. Dr. Willem Rudolfs of Rutgers has been associated on the project.



RAILROAD INDUSTRIAL Waste Treatment Plant

RODNEY COLTART
Sanitary Engineer, Link Belt Co.

IN cooperation with the Commonwealth of Pennsylvania's Clean Streams Program, the Pennsylvania Railroad has placed in operation at its Enola, Penna., yards, a treatment plant for the handling of the industrial wastes resulting from the yard operations. This yard is the largest freight classification yard in the world. Extensive facilities are provided for the maintenance and repair of freight cars, steam, electric and Diesel locomotives. Approximately 1500 employees are normally at work in the yard.

The wastes to be handled by the treatment plant includes the water used for locomotive and car washing, that from ash quench pit operation and the sanitary sewage from the buildings in the yard and storm water from the yard drainage system. The treatment plant is designed for an average flow of 2.0 mgd, with a maximum storm flow of 4.0 mgd. During high storm flow runoffs, all flows over the 4.0 mgd. rate are bypassed at a diversion manhole directly to the Susquehanna River. Approximately one-third of the flow comes to the plant by gravity; the remainder is elevated at a pump station in order to get it into the 24″ dia. plant influent sewer.

Two Phases of Treatment

Treatment of the waste water is divided into two phases: Plain settling is first provided to separate the readily settleable solids and floating oils, and this is followed by chemical treatment to precipitate the fine solids and to break up the oil emulsions. Sludge and oil removed from the waste water is lagooned. A flow diagram of the treatment plant is shown herewith. The treatment procedure and plant units are:

The waste first flows into two primary settling tanks each 9′0″ wide, by 6′0″ average water depth, by 52′0″ long. These tanks are designed to provide a 30-minute detention period at the design flow of 2.0 mgd. with a surface loading of 2140 gals. per square foot per day. The tanks each have two steel notched effluent troughs and the design overflow rate per foot of weir is 27,800 gals. per day.

Each tank is equipped with a Link-Belt straightline primary type longitudinal sludge collector, with a 10-inch Rotoline oil skimmer and a telescopic sludge drawoff valve. A single deep sludge hopper was provided in each tank so that the settling solids could be withdrawn with as high a solids content as possible by the telescopic valve. Special treatment was also given the side walls of the tank so that floating oil was fully confined by the collector flights on the skimming run. As a result, very little water is drawn off with the oil by the skimmers.

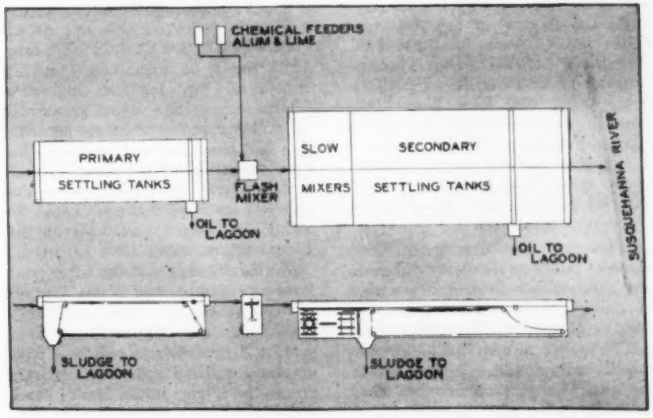
The effluent from the primary settling tanks passes through a flash mixing tank 6′0″ square in plan by 7′0″ water depth and then to two slow mixing tanks each 18′0″ wide by 9′1″ ave. water depth by 18′0″ long. The flash mixing tank provides a detention period of 1.35 minutes and at this point alum and lime are added for flocculation. A Link-Belt 24-in. diam. flash mixer is installed in the tank to assure intimate mixing of the chemicals with the water.

Mixing and Flocculation

A detention period of 30 minutes is provided by the slow mixing tank and each tank is divided into 3 sections by transverse wood baffles. Two lines of Link-Belt slow mixers are installed parallel with the flow in each tank. The shafts of the slow mixers extend into a dry well and one drive unit is provided for each tank. Each drive is a Link-Belt PIV, complete with input and output gear sets in a common housing with the variable speed unit. The drive is designed to provide a peripheral paddle speed variable between 0.7 and 1.4 ft. per second.

After flocculation the waste water passes into two final settling tanks each 18′0″ wide, by 8′0″ average water depth, by 90′0″ long. These tanks are designed to provide a 2.3-hour detention period at the design flow with a surface loading of 620 gals. per square ft. per day. The tanks each have two steel notched effluent weirs and the design overflow rate per foot of weir is 14,000 gals. per day.

Each tank is provided with one Link-Belt straightline longitudinal primary type sludge collector and one 4′0″ wide cross sludge collector. A 10-inch diameter Rotoline skimmer and a telescopic sludge drawoff valve is also provided for each tank



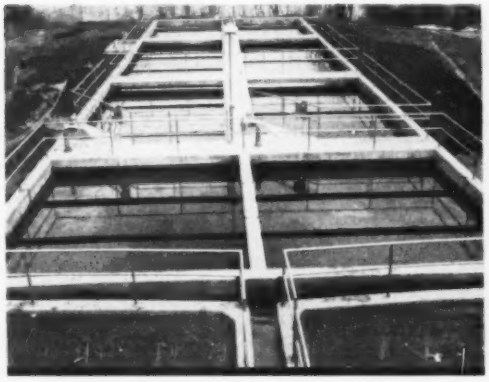
● *FLOW diagram showing the two phases of treatment at Enola.*

so that oil and sludge may be drawn off at as high a concentration as practical. The effluent from the settling tank flows into the Susquehanna River without any further treatment.

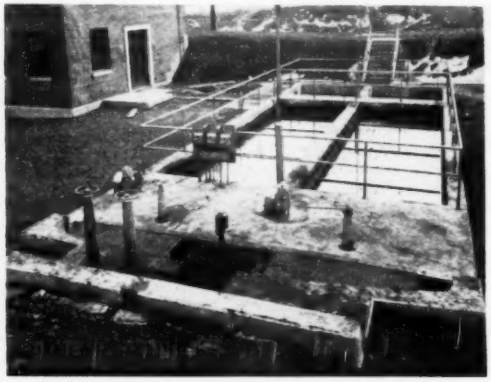
Two earth-embankment lagoons with a total capacity of 6,300,000 gals. are provided for the disposal of the sludge and oil from the settling tanks. Decanting pipes are provided so that supernatant liquor may be returned to the flash mixer tank for additional treatment.

A two-story concrete and brick control building approximately 20'0" by 30' 0" in plan, houses the chemical feeding and storage facilities, sludge and water pumps, electrical control center, flow meter and accessories. A laboratory is provided so that a check can be maintained on the efficiency of the plant operation. Results of the operation of the plant show that an excellent job is being done on the removal of oil and suspended solids from the waste water.

The project was constructed under the direction of the Engineering Department, Eastern Region, of the Pennsylvania Railroad Company. Gannett Fleming Corddry & Carpenter, Inc., Consulting Engineers of Harrisburg, Pa., designed the plant structure and waste treatment facilities. Brann & Stuart Co., Inc., of Philadelphia, Pa., was the General Contractor.



● ***SLOW mixing tanks in foreground and final settling tanks in rear treat yard waste water.***



● ***Detention of 30 minutes is provided in two preliminary settling tanks at Enola plant.***

High Rate Water Filtration at Chicago

SINCE February 1948, ten of the eighty filter units of Chicago's South District Filtration Plant have been operated at rates of 4, 4½ and 5 gpm per sq. ft., the other 70 being operated at 2 gpm. The results were described in detail by John R. Baylis in the Journal of the American Water Works Ass'n for July, 1950. (See the *Water Works Digest* in September, 1950, PUBLIC WORKS). In the June, 1951 *Pure Water* (the monthly publication of the South District Filtration Plant), Mr. Baylis presents the data brought up to April, 1951. This report shows no material changes from those given in the paper referred to.

Comparing the "time in service" of filters operated at these different rates, the tables show the average times to be 99.0% at the 2 gpm rate, 97.9% at 4 gpm, 97.5% at 4.5 gpm, and 96.8% at 5 gpm. The lowest monthly rate for the 2 gpm filters was 98.2; for 4 gpm it was 96.7; for 4.5 gpm it was 95.9; and for 5.0 gpm it was 94.6%.

The "length of the filter run" at the different rates differed approximately inversely as the rate; that is, the amounts of water filtered per run were approximately the same at all rates. The length at the 2 gpm rate averaged 34.6 hr.; at the 4 gpm it averaged 18.5 hr.; at 4.5 gpm, 15.6 hr.; and at the 5 gpm rate, 12.05 hr. It is explained that the length of run for the high-rate filters would have been greater if the influent piping and rate controllers had been properly designed for such operation. It is estimated that, with proper hydraulic design, the runs on the 5 gpm filters would be about 25% longer, and those on the 4 gpm filters about 10% longer.

Mr. Baylis says that the filter performance (amount of water filtered per foot loss of head) was 41% greater for the 4 gpm filters than for the 2 gpm filters; and was 62% greater for the 5 gpm filters; partly due to the higher initial loss of head. This higher filter performance should apparently permit some saving in operating cost. The reduction in filter size would permit a saving in construction cost of the filters themselves, but there would be less proportional saving in piping, controllers and other features of the plant. The saving on the plant as a whole due to constructing high-rate filters would probably be between 5% and 10%.

The quality of the effluent was excellent at all rates. At no time was there measurable turbidity in any of the effluents. In very few cases was there even a trace of floc in the effluent from the 5 gpm filter. As to coliform bacteria, the counts per 100 ml. for the year 1950 for the 2 gpm filters averaged 0.018; for the 4 gpm filters the average was 0.013; for the 4.5 gpm filters was 0.027; and for the 5 gpm filters was 0.019. (In this calculation we have omitted one count in each class of filters which was so out of line with all the others as to be thought to be due to faulty sampling). Approximately half of the monthly average counts for each class were zero, this being true for 58% of the counts for the 2 gpm filters, 71% for the 4 gpm, 40% for the 4.5 gpm, and 46% for the 5 gpm.

A Ten Billion Gallon Industrial Water Supply

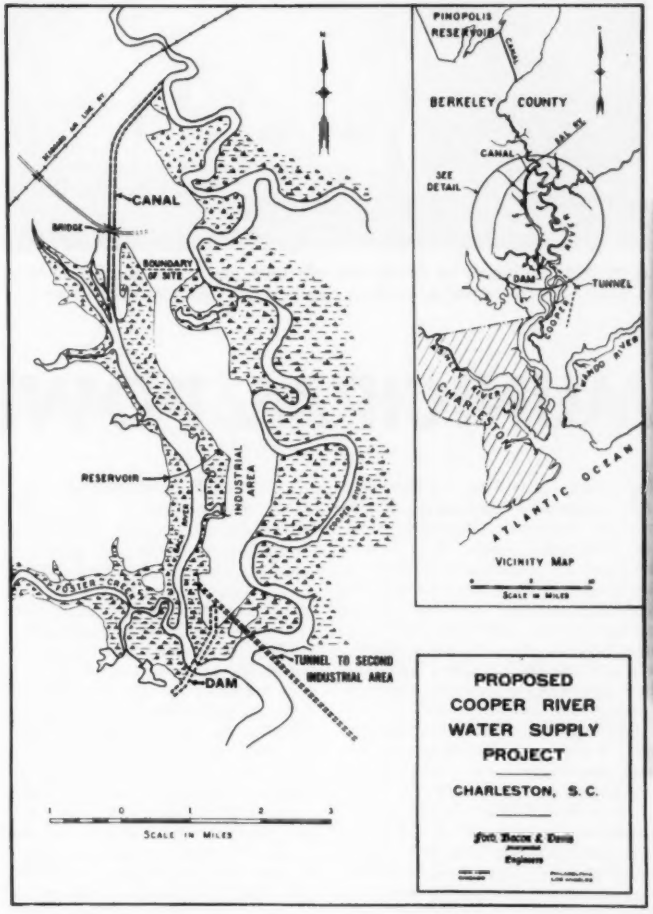
AN interest-free advance of $175,000 has been made available to the Public Works Commission and the City Council of Charleston, S. C., to assist in the preparation of plans for development of one of the largest industrial fresh water sources on the North American continent. With completion of the first stages of the so-called Cooper River Water Supply project, which will eventually cost $4,405,000, a supply of approximately 2.5 billion gallons a day will be available. Further developments, including a tunnel to link a new reservoir with the city, will increase the supply to a daily potential of 10 billion gallons of soft fresh water, principally for industrial use.

Industry requires vast quantities of fresh water and an industrial area above the city in the section between the Cooper and Back Rivers known as Bushy Park is to undergo large expansion. World War II transformed Charleston, with its deep ocean harbor, into a busy industrial city but the boom collapsed after the end of the war.

Now, with the great water supply in prospect, Commissioner Pere F. Seward of HHFA's Community Facilities Service, which administers the Advance Planning Program for Non-Federal Public Works, has certified this project as one that may contribute directly and importantly to defense operations. It also is in conformity with criteria governing projects to meet essential civilian requirements. The advance grant will be returned when construction work is started.

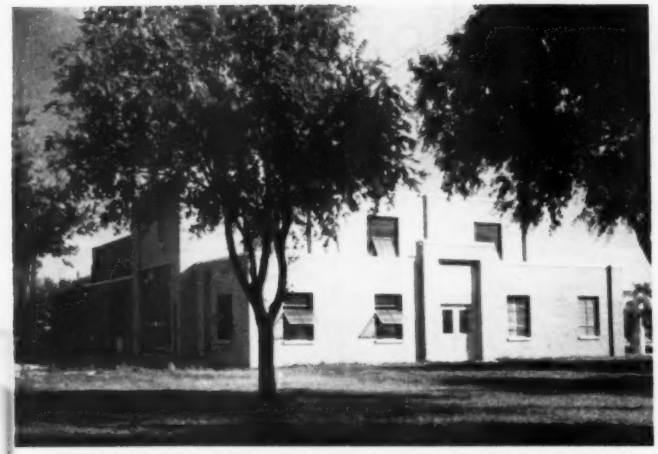
The initial step of the Cooper River Water Supply project proposes construction of a canal 3½ miles long from an upstream point in the Cooper River to the Back River. This will be below the tailrace of the Santee-Cooper hydroelectric plant where the turbines discharge an average of 10 billion gallons into the Cooper every 24 hours.

A channel will be dredged in the Back River and a dam will be built to create a 1,000-acre impounding basin with a dependable supply exceeding 2.5 billion gallons daily. The earth-filled dam will be 6,700 feet long and its crest will rise above hurricane tide level.

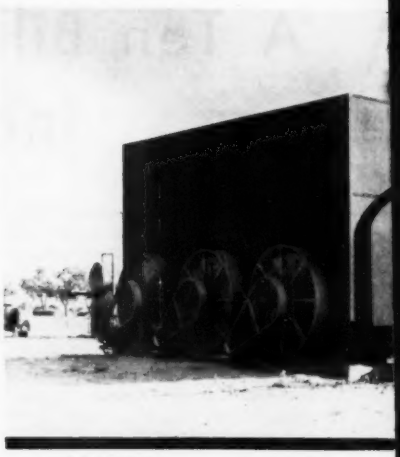


Because sea water intrudes into the lower reaches of the Cooper River its tremendous volume hitherto has been useless for industrial purposes. The initial project will provide heavy diking in the reservoir area to outflank the salt water intrusion of storm tides. A highway bridge also will be built over the canal.

Ford, Bacon & Davis, Inc., of New York, are the engineers whose report on the preliminary investigations of tide and river levels and of fresh water supply are included in the city's application for advance planning funds. The project is endorsed by the State Board of Health, the South Carolina Research, Planning and Development Board, and the Charleston County Civil Defense Director. It was described in the *Saturday Evening Post* of January 6 of this year.



● ***PLANT** building at Goodland was enlarged when dual-fuel engine was installed, providing engine, switchboard and office.*



● ***COOLING** system has rating of 6,000 hp and tower and piping*

MUNICIPAL POWER PLANT

A NEW 2,000-hp. Fairbanks-Morse dual-fuel engine has carried the profitable Goodland, Kansas, municipal power plant into a new era of operating economy. In the engine's first five months of service, savings on fuel have amounted to more than $2,000 a month. This year, it is planned to convert a 1,600-hp. diesel to dual-fuel operation in order to achieve further reduction in the fuel bill.

Goodland and its power system have been growing rapidly in size and prosperity in the past decade. Population rose from 3,300 in 1940 to more than 5,000 in 1950 and the growth is continuing at an accelerated pace. Activity is high in both residential and commercial building. Necessarily, community services must keep pace. The past year saw completion of a $125,000 city building and a new ultra-modern school.

No modern city can develop without concomitant development of its power facilities. Goodland purchased its electric distribution system from a private utility company in 1937 and built a power plant with three Fairbanks-Morse diesels: a 700 hp., a 500 hp., and an old 180-hp. unit that had been in service in the city's water plant. Initial rates announced by the city were 20 percent lower than the utility charges previously in force.

New Engines Added

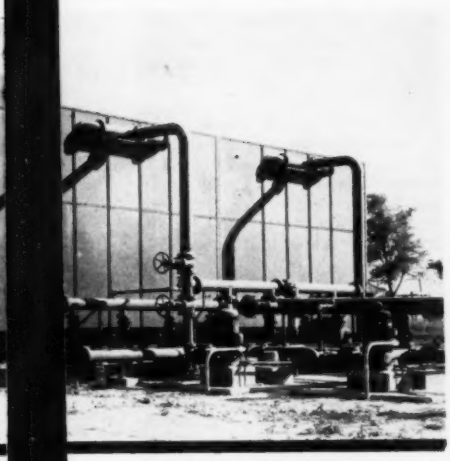
In 1939, the 180-hp. engine was sold to Herndon, (where it is still in operation) and Goodland put in its place a 1,225-hp. Fairbanks-Morse diesel, driving directly a 768-kw. Fairbanks-Morse alternator. In 1940, the three-engine plant generated a total of 2,841,900 kw. hr. Load grew as the city grew, but normal growth was inhibited by the war and the unavailability of additional engines. In 1947, the city installed a 1,600-hp., F-M diesel driving a 1,125-kw. F-M alternator. This permitted an increase in power production which reached 7,351,000 kw. hr. in 1948. On August 1, 1950, the city put into service its biggest engine, a 2,000-hp. dual-fuel engine, driving a 1,400 kw., 1,875 kva., 4160 volt F-M alternator. The 1950 peak load reached 2,300 kilowatts. Total production for 1950 was a record 8,480,100 kw. hr.

The plant has been consistently profitable. In the last decade, net profits after depreciation ranged from a low of $29,450.62 in 1941 to a high of $51,317.35 in 1946. Although the price of fuel rose from $.045 a gallon in 1938 to $.105 in 1950, production economies were a compensating factor and consumer rates were never raised. Though profits declined somewhat from the 1946 peak, the total for the past five years topped $200,000.

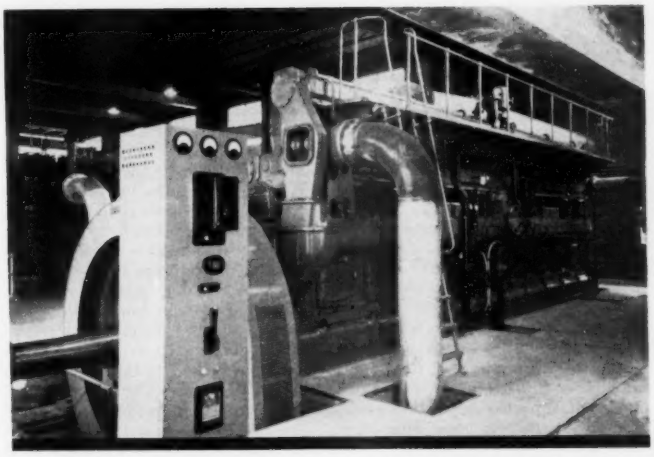
Natural Gas Fuel

To meet the rising cost of fuel, Goodland turned to natural gas as a source of power. The 2,000-hp. engine is designed to operate on gas with a small quantity of oil as a pilot fuel. Put on the line August 1, 1950, the unit ran a full five months by the end of the year and generated 2,209,600 kw. hr. while consuming 28,043 cu. ft. of gas and 17,323 gal. of pilot oil, an average of 12.69 cu. ft. of 975 btu. gas and .0078 gal. of 133,000 btu. oil per kw. hr. This, of course, was a period of break-in and adjustment and the last month reported showed the best fuel efficiency.

Natural gas at an average price of $.223 per MCF is far more economical than oil at $.105 and the new engine has effected substantial reductions in generating costs. At the fuel prices prevailing in each month reported, the dual-fuel unit's production of 2,209,600 kw. hr. would have entailed the expenditure of $18,904.47 for fuel if generated by the oil burning diesels. In fact, the actual fuel expenditures were $6,251.86 for gas and $1,796.18 for pilot oil, a total of $8,048.04. This represents a five-month saving of $10,856.43. Fuel costs averaged $.00364 per kw. hr. for the full period and were down to $.00326 in December.



are divided so half of system can be operated independently.



● *VIEW of engine room shows the new 2,000-hp dual fuel engine in foreground, 1,600-hp unit just behind; and 1,226-hp in background.*

BOOSTS PROFITS $2,000 a MONTH

Because of its superior economy, the dual-fuel engine was run 2,236 hours in the five months and produced 63 percent of the plant's total production. Obviously, though, the one big engine cannot do the job alone. Peak loads necessitate the operation of additional units and valley loads are too low for efficient performance. Consequently, Goodland plans conversion of the 1,600-hp. engine. The F-M dual-fuel system can be applied to engines in the field. Thus, with conversion parts, the old engine will be virtually identical to a new dual-fuel and will have full operating efficiency.

A distillate oil of 32-36 gravity is used as fuel for the full diesels and as pilot fuel for the gas-burning engine. The plant has six storage tanks totaling 92,000 gal. From storage the oil is delivered by a Roper motor - driven transfer pump through Nugent filters and Pittsburgh meters to individual concrete basins underground outside the plant. The engine supply pumps pick up the oil which is filtered again before reaching the injection system. In the case of the dual-fuel engine, a constant charge of pilot oil is delivered to the cylinders by individual small - volume injection pumps which meter the fuel accurately.

When operating as a dual-fuel, the engine switches instantly and automatically to full diesel if the gas supply fails and returns to gas when that fuel is again available.

Scavenging air for the 2,000-hp. two-cycle engine is drawn through an Air-Maze four-element oil-bath filter and is delivered to the engine by a Roots motor-driven blower. Air intake is controlled by a governor-regulated admission valve which provides the proper gas-air ratio and insures adequate air for full combustion under all load conditions. The blower motor is hooked to the generator leads through protective relays. A 48-volt battery set forces the field of the alternator and insures power to drive the blower when the engine is started.

Use of clean-burning gas improves lubrication economy. The 2,000-hp. unit consumed only 858 gal. of lubricating oil in 2,236 hours of operation, an average of 5,212 hp. hr. per gal. of lube.

At the time the 2,000-hp. engine was installed, Goodland put in a complete new cooling system featuring a forced draft cooling tower with a 6,000-hp. rating. The tower and piping are divided so that half the system can be operated independently. Jacket water is circulated by three F-M 1,000 gpm. vertical turbine pumps driven by 15-hp. motors. All the engines are served by a 12-in. header. The engines discharge into a 16-in. return flume, from which water flows to the tower coils. At present two pumps are sufficient to handle needs with the third as a standby. At capacity, however, the tower will require 3,000 gpm. and provision has been made for a fourth pump to continue the standby protection. Raw water is circulated by a pair of Pomona motor-driven vertical turbine pumps.

A compact alarm panel was designed by Paul Loomis, Superintendent of the Electric Department. More than 25 boards have been built on this design. For his own plant, Mr. Loomis also designed and built a control and alarm panel for the new cooling system. Before taking the Superintendent's post in Goodland in 1948, Mr. Loomis was an erecting engineer for Fairbanks-Morse for 15 years. In that capacity, he installed the 1225-hp. and 1600-hp. engines. He also installed the 2,000-hp. unit and designed the plant addition to accommodate it.

The municipal utility is operated under the general supervision of Mayor George A. Sanders and Councilmen C. Wilbur White, Frank D. Elliott, B. Bob Ward, Basil Robertson, Harlan McDaniel and Mark Jensen. Ray E. Lundy is city clerk.

REPORTS *from the* FIELD
Better Methods and Equipment

A MOTOR GRADER was used for excavating for curb and gutter. A scarifying tooth was put on the end of the moldboard and used to rip up the proposed location for the curb and gutter. The moldboard was swung to an almost straight position and tilted. The scarified material was rolled out of the way. Generally, the procedure was repeated to insure plenty of clearance and lighter finish grading by hand. When the preliminary work has been done properly, two men can finish-grade 1,500 ft. in 8 hours time.—G. E. Beinhorn, Sup't. of Public Works, Exeter, Calif.

A CONTRACT was let last spring by Glendale to the Nichols Engineering & Research Corp. for a 112½-ton incinerator, and a contract to the Morley Building Co. for a building to house 112½-ton incinerator units, but only one of these units is being constructed at this time.—J. C. Albers, City Engineer & Street Superintendent, Glendale, Calif.

WE PURCHASED a Wayne sweeper this fall to replace our old sweeper, with which we have been sweeping our streets. We have found that with the new sweeper, due to a reduction in the down time required on the old sweeper for repairs and maintenance, and because the new sweeper covers the same area in less time, our costs of operation are cut practically in half.—Neil J. Cummins, Director of Public Works, Salinas, Calif.

A BARBER-GREENE paving plant, and Adnun mixer and a Littleford distributor have been used very effectively by Lamar. We progressed to the point where we were laying 2-inch asphalt mat over an area 43 ft. wide and 600 ft. long in 10 hours, using 340 tons of mix. The mixing plant is a model 840-F, with a capacity of 25 to 35 tons an hour.—George H. Russell, City Engineer, Lamar, Colo.

WE HAVE DEVISED two pieces of equipment to meet our special needs. One is a pipe lifter; the other a winch truck. The boom was made by welding an 8-inch pipe and cross-member to the truck frame. A 6-in. pipe slips into this 8-inch pipe and rides on a plate bearing, permitting the boom to swing freely. This was mounted on a 4 x 4 surplus truck. The pipe lifter was built on the running gear of an old wagon, using the front wheels and tongue only. A bow of 1¼-inch round bar stock was placed on the axle and braced to the tongue with pipe of the same size. In operation, the tongue is raised by hand and a chain from the bow is hooked into the pipe. Then the tongue is pulled down by hand, lifting the pipe out. About 6 miles of iron pipe, 5-in. to 8-in., has been removed thus far at a cost of less than 5 cents a foot. The pipe was buried 12 to 24 ins. deep, but was pulled out without uncovering and with almost negligible breakage. A team of horses was used to move the puller. Previously we tried a heavy winch truck and bulldozer, but these gave too much power and bent iron pipe and broke cast iron.—L. R. Kuiper, Commissioner, Delta, Colo.

THE CITY OF New London has owned two chain saws for nearly a year now. One is a large two-man type for heavy work and the other is a small electric saw for trimming. In the short time that these saws have been in use nearly all known diseased elm trees have been removed. Considering the man-hours spent on this work the results are most gratifying. After the severe storm of Nov. 25, 1950, when so many trees and branches blew down, with the help of these saws all streets were cleared and most of the debris hauled away by nightfall the following day. The writer is sure you will receive favorable comment from anyone who owns these timesavers. — William M. Baker, Superintendent of Streets, New London, Conn.

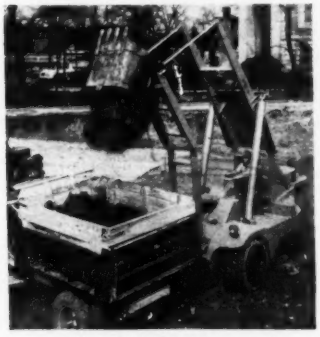
THE CITY OF Bartow is enjoying noticeable profits resulting from the purchase of an Elgin 81 street sweeper. Before we made the decision to purchase this machine, we were well convinced it would pay for itself in a short time by considerably reducing other costs. Specifically, we found, upon putting the sweeper into use, that we eliminated the necessity for three men and one truck; also we found that the machine, which is of 3-yd. capacity, could haul and dump its own loads at various points in the city, making it unnecessary to have the loads picked up and hauled to dumps. This sweeper has virtually paid for itself within one year from the time it was put into use.—C. R. Odom, City Manager, Bartow, Fla.

IN WIDENING an old street from 22 ft. to 36 ft., we used our ¾-yd. Hough front end loader for excavating and grading the 7-ft. strip on each side of the street. The old straight curb was temporarily left in place and the excavation for base and for new curb and gutter was carried on without interfering greatly with use of the old street. After the new curb and gutter was completed, the front-end loader was used to remove the old curb and gutter and to load it into trucks. The loader worked out very well in both operations and the job was completed at considerably less cost than it could have been done by contract. Our cost was 75¢ a cu. yd. against $2.25 bid by contractors.—Erwin G. Hill, City Engineer, Waseca, Minn.

OUR CITY OWNS a Barber-Greene hot-mix asphalt plant, 20 tons capacity per hour. This was used very effectively for maintenance of bituminous surfaced streets and for hard-surfacing existing gravel streets. MC-4 cutback asphalt was mixed at the rate of 12 gals. per ton with pit run gravel crushed to a ¾-inch maximum size. This was the wearing course. It was spread with a Galion motor patrol and rolled with a Galion 3 to 5-ton roller. A Rosco distributor was used to fog the street surface with 0.15 gal. per sq. yd. of MC-4 prior to laying the mix. Due to limited storage capacity, one type of asphalt must be used for as many purposes as possible. MC-4 seems to be best suited in this climate for tack coat, plant mix and seal coat. —E. F. Hensch, City Engineer, Fergus Falls, Minn.

WE HAVE DEVELOPED a cantilever roller system for patch rolling which permits us to pull the roller through the streets from job to job on a truck, but without lifting the roller into the truck for the move.—J. Ray Graham, Street Commissioner & City Engineer, Jennings, Mo.

THE DEMPSTER-DIGGSTER, Type GRD, same as the one that loaded 600 tons of stone recently, has a 15 foot six inch turning radius, is 20 feet long when bucket is in traveling position, and bottom of bucket is nine feet three inches above ground when in extreme dumping position. It will dig 15 inches below grade and through a 15 foot bank. Note how bucket follows the slope of the material.



THIS DEMPSTER-DIGGSTER, Type HL, is specially equipped for high dumping. The bottom of the bucket is 13 feet six inches above ground. It will dig through an 18 foot bank.

FOR FAST, EFFICIENT operation in difficult terrain, the Dempster-Diggster is available with crawler-type traction.

Fast Automotive Shovel Loads 600 Tons of Stone in Half a Day

CONTRACTOR REPORTS: HYDRAULIC CROWD, HOIST UNIT "FILLS LONG NEEDED PLACE IN OUR INDUSTRY"

THE DEMPSTER-DIGGSTER, a revolutionary shovel loader, recently loaded 600 tons of broken stone in the first half day of operation. This outstanding performance was reported to Dempster Brothers, Inc. by W. E. Lambert, president of Lambert Brothers, Inc., one of the nation's largest crushed stone contracting firms.

"In connection with our extensive activities in several southern states," the contractor said, "we have used various types of power shovels and front end loaders. After seeing the easy operation of the hydraulically operated Diggster in a demonstration we had made alongside of a competing loader, we placed an order with you. We installed the Diggster equipped with a yard and half stockpile bucket on one of our operations in western North Carolina.

"Our records show," he continued, "that the unit loaded approximately 600 tons of broken stone in the first half day of operation. The Diggster has been working continuously and is giving perfect satisfaction. It is a pleasure for us to so advise you because in our opinion the Diggster fills a long needed place in our industry. We welcome you to bring any interested parties to our operation to see the Diggster in action."

The tremendous speed of the Dempster-Diggster in excavation and stockpile work is accounted for, mainly, by its exclusive independent hydraulic crowd and hoist action, the hydraulic steering, and wheel-type traction, which permits truck speeds to and from jobs. The power crowd permits bucket to keep digging until loaded . . . no digging with wheels. The hydraulic steering gives the driver easy, fast, finger-tip control.

Four standard interchangeable buckets of two types are available. Digging buckets with four bottom teeth in 1 and 1¼ cubic yard (heaped) capacities; materials handling buckets in 1½ and 2 cubic yard (struck) capacities.

Complete information and prices may be obtained by writing the manufacturer, Dempster Brothers, Inc.

DEMPSTER DIGGSTER

DEMPSTER BROTHERS
991 Dempster Building
Knoxville 17, Tennessee

Now's the time to mail this month's Readers' Service card.

Air-Gravel Concrete

A LIGHTWEIGHT concrete recently developed by R. C. Valore, Jr. and W. C. Green of the National Bureau of Standards substitutes air bubbles for sand. In this air-gravel concrete, the conventional fine aggregate or sand is replaced by air bubbles, which act as a "lubricant" and produce a very workable mixture. High-air-content concrete is prepared in conventional mixing equipment in the normal way, except that an industrial aerating agent or a detergent is added to the mix to cause it to foam by entraining finely-divided air cells in the cement-water paste. Entrained air may constitute up to 45 percent of the volume of the concrete and "pea gravel" forms the dense aggregate.

The mixtures studied consisted of a high-early-strength portland cement, siliceous pea gravel (No. 4 to $\frac{3}{8}$-in. sieve fraction), water, and an air-entraining agent. Two different air-entraining agents (foam stabilizers) were used: agent V, a proprietary neutralized resin; and agent X, a proprietary sodium lauryl sulfate-type detergent. The falling action of the gravel particles during mixing in an ordinary rotating tilt-drum mixer produced the entrainment of air in the cement-water paste, and the air-entraining agent rendered the foamed paste stable.

Effect on Strength

Air contents as high as 45 percent were found possible in concretes containing no sand, while there appeared to be a "ceiling" of about 30 percent in the air content of experimental mixtures containing both sand and gravel. However, the amount of entrained air, upon which the density depends, was limited critically by the minimum compressive strength requirement of 500 lb/in^2. The lowest cement content permitting the attainment of the required strength in an "air-gravel" concrete was about 3¼ bags of cement per cu. yd. of concrete. In this "lean" mix (mix A) it was necessary to maintain an air content of about 25 percent to provide the necessary workability and strength. A second mix (mix C), containing about 5.6 bags of cement per cu. yd. of concrete, provided the required strength for air contents as high as 29 percent.

The compressive strength was sensitive to variations in air content; an increase of 1 percent in air content was generally accompanied by a decrease of about 100 lb/in^2 in compressive strength for both mix A and mix C. The indicated density of concretes having a compressive strength at 28 days of 500 lb/in^2 was about 113 lb/cu. ft. for mix A, and 105 and 109 lb/cu. ft. respectively for mix C concretes made with the resin and detergent air-entraining agents, as compared with 140 to 145 lb/cu. ft. for conventional (nonaerated) sand-gravel concretes. While the compressive strengths were only one-fourth to one-fifth the values obtained for nonaerated concretes, the moisture properties and thermal conductivity of the air - gravel concretes compared favorably with the values obtained for the denser concretes.

The mean water absorption of the lightweight concretes upon soaking for 24 hours at room temperature was about 9 percent (by volume) for all mixes, compared with 11 to

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McWane Open Bell B & S Super deLavaud Pipe is furnished in sizes 3-inch through 12-inch.

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Efficient, economical snow clearance now is within the reach of even small budgets with the Snow Master *Junior*, a product of Sicard research and engineering. Husky, powerful and versatile, the *Junior* answers the demands of a host of new users who want a low-cost machine able to stand the gaff all winter long. It has proved itself the ideal machine for many cities, towns, smaller communities and large industrial plants. The *Junior* also is in demand as auxiliary equipment to the larger Snow Master in the biggest cities and on airports and airdromes.

The *Junior's* 100-inch wheelbase makes it highly manoeuverable, and its sturdy four-wheel-drive gives it positive traction in the heaviest snow and slush. This versatile machine has all the job-proven Sicard features: twin augers with unique equalizer bar, long-range reversible casting turbine to propel snow far from cleared areas, and the patented Sicard "Wrist-Action" Chute for pack-loading moving trucks or spot-casting snow to vacant lots, lawns or fields. The *Junior* is equally at home in narrow laneways, around buildings, on hangar aprons and in busy downtown traffic areas. It gives big-machine performance at small-machine cost.

* The Chrysler Ind. 8 gasoline engine used for motive power on the Snow Master Junior is now equipped with GYROL FLUID DRIVE. Slippage allows for slow down of vehicle in heavy snow without changing of gears; reduces wear and tear on clutch—simplifies operation.

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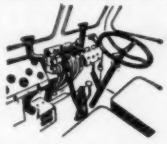

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"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

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PW-9

15 percent for conventional concretes of similar materials and cement contents. Saturation coefficients, calculated as the ratio of the 24-hour room temperature absorption, to the 5-hour boiling absorption, ranged from 0.22 to 0.36, or about one-third the magnitude of values for nonaerated sand-gravel concretes. The saturation coefficient purports to represent the ratio of the pore volume easily filled by water total pore volume. The drying shrinkage of the air-gravel concretes did not differ significantly from values obtained for nonaerated sand-gravel concretes, ranging from 0.04 to 0.07 percent for 2- by 12-in prisms after 180 days drying.

Of 13 specimens of mix A and mix C concretes subjected to 100 cycles of laboratory freezing (0°F air) and thawing (70°F water), only one specimen (mix C) failed at 40 cycles. Two specimens of nonaerated sand-gravel concrete failed at 60 cycles.

The thermal conductivity of these concretes, as determined in the NBS guarded hot-plate test, ranged from about 5 to 6 Btu [hr. ft.^{2} (0°F—in.)]; a value obtained in tests of a nonaerated sand-gravel concrete was 9. A value often cited for conventional concretes is 12, but values ranging from 7 to 16 have been reported.

The air-gravel concretes developed at the National Bureau of Standards are considered experimental at the present time. The advantages in reduced density and thermal conductivity are appreciable but are gained only at a great sacrifice in strength. Greater advantages might be gained with higher cement contents and higher air contents, but the relatively high density of conventional aggregates imposes certain limits. The use of lightweight aggregates blended with dense aggregates in relatively high-air-content concretes may be a means of obtaining worth-while reductions in density and thermal conductivity while maintaining low-order drying shrinkages.

BIGGEST TURBINE PUMPS

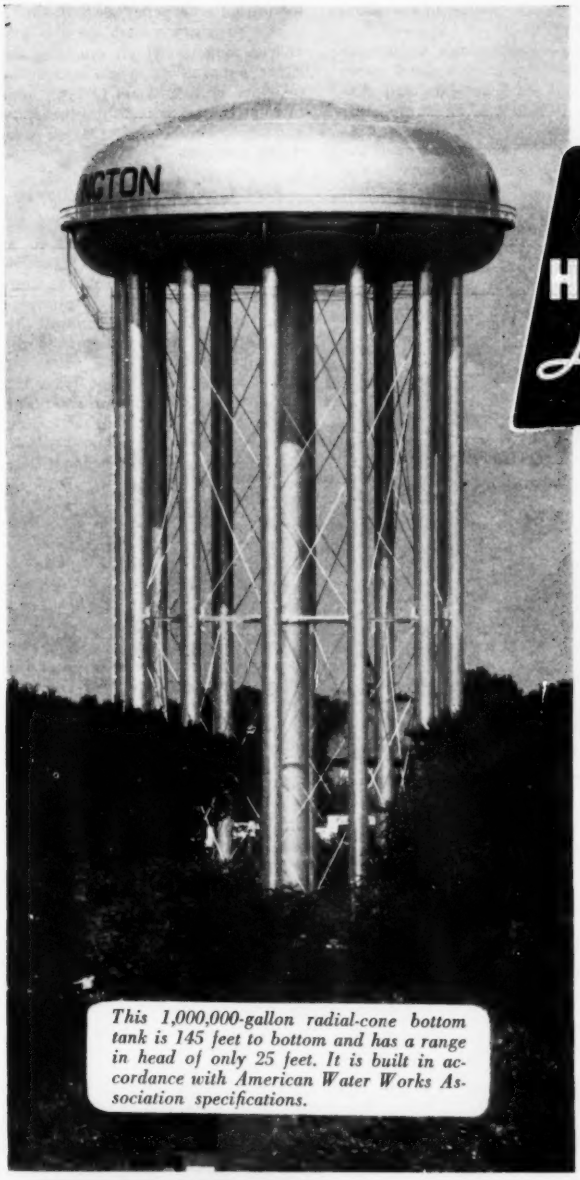
for NEW YORK HUDSON RIVER SUPPLY

ONE of the problems of getting water from the Hudson River to supplement New York City's supply was the design of pumps that could provide 100 mgd against a 575-ft. lift. Though the specifications permitted considerable latitude in design, the pumps had to be centrifugal, either vertical or horizontal, designed for 575-ft. head but suitable for operation for any head between 525 and 625 ft., and each of a capacity equal to 100 mgd divided by one less than the number of pumps installed.

The installation consists of six vertical Peerless pumps of the deep well type, with five stages, each pump having a capacity of 20 mgd under a head of 600 ft. The pump bowls are 36 ins. in diameter, and the discharge is 24-inch. The motors are General Electric, of the synchronous type, each rated at 2500 hp and operating at 900 rpm on 3-phase, 60-cycle current at 4,000 volts.

Magnetic starting equipment is provided for each of the pump motors and is designed to limit the maximum current inrush to no more than 10,000 kva. Each unit has a circuit breaker of 250,000-kva interrupting capacity with time-delay-undervoltage, overload and short circuit protection. The connection between each pump and the discharge header contains a 20-inch conical plug check valve, a tee with a branch containing a 10-inch gate valve and a Pelton surge suppressor, and a 24-inch motor operated gate valve.

Automatic controls provide a fixed sequence of valve operation when starting and stopping the pumps normally, and in emergency operation when there is a power failure. Before a pump can be started, the following conditions, controlled by electric interlocks, must be fulfilled: (1) that the discharge header is under pressure from the tunnel, the control being by a pressure switch connected to header; (2) the accumulator tank of the oil system, operating the twenty-inch cone valves, is up to pressure and the oil at operating level; (3) the 24-inch pump discharge valve is open; (4) the 36-inch cone valves at Shaft 6 are open. In starting, the motor is brought to full speed and synchronized, which requires about two seconds, before the 20-inch cone valve starts to open, requiring two minutes. In closing, when the stop



This 1,000,000-gallon radial-cone bottom tank is 145 feet to bottom and has a range in head of only 25 feet. It is built in accordance with American Water Works Association specifications.

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HERE is another shining addition to Indiana's growing family of Horton elevated water tanks. It's the new 1,000,000-gallon installation at Huntington. Rising above this city of 18,000 people, it signifies dependable water service for years to come.

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button is pressed, the cone valve starts to close and when closed, a limit switch stops the motor.

In an emergency shut-down due to power failure, all the cone valves close in nine seconds, and all the surge suppressors open in one second (they are set to close in fifteen seconds), simultaneously disconnecting the motors; due to loss of control voltage, the cone valve and surge suppressor on the affected circuit function and stop the motor; due to electrical failure of motor or starting equipment, all suppressors open in event the line pressure drops below the setting of the pressure switch.

Opening of any surge suppressor will cause its respective check valve to close in nine seconds and disconnect its motor. The surge suppressors are equipped with spring-loaded relief valves set to open the surge suppressor whenever the pressure in the discharge conduit exceeds 700 feet, and a hydro-pneumatic accumulator maintains a sufficient pressure for quick opening of the surge suppressors even though an abnormal decrease in pressure occurs in the discharge conduit following an emergency shut-down.

The pressure switch on the discharge header which operates the surge suppressors when subnormal pressure occurs, is set to open contacts at 157 psi with falling pressure and close contacts at 174 psi with rising pressure.

Pipe Lines and Connections

The discharge header in the pump room varies in size from 24 to 54 inches, the diameter of the discharge conduit. The discharge conduit rises steeply from the pumping plant, sixty feet to a summit air valve, then slopes to a shaft to the aqueduct.

The intake is 660 feet from the shoreline, or 764 feet from the pump house, in fifty-four feet of water, with its top at elevation —41.0 ft. The intake conduit, 72 inches inside diameter, is of reinforced concrete pipe. The joints were formed by steel spigot and bell rings welded to the longitudinal reinforcing bars, with a rubber ring gasket for sealing the joint.

The operating floor of the pumping station is U-shaped, the south wing containing the pump room. The central portion is largely devoted to enclosed fireproof chlorine tank storage and the north wing to the operating heads of the racks and screens; boiler room and storage space. The station is 168 ft. long and 72 ft. wide. In the pump room there are three pump wells, each with two pumps. A 36 x 42-inch sluice gate admits water to each well. Extending for forty feet from the pump well, an overflow weir, crest at Elevation + 7.0 ft. is built into the river side wall of the dilution chamber where sediment is settled out.

Discharge, from the pumping system into the Delaware Aqueduct, is at a shaft located 850 feet inshore from the east bank of the Hudson River and connected with the pumping plant by a concrete lined steel riser pipe, forty-eight inches in diameter.

The discharge pipe is ¾-inch thick and made of Grade B firebox steel, ASTM. Serial Designation A285-46. The fabrication of the conduit, and the design of the various portions of the conduit conformed to the appropriate paragraphs of the 1950 code of the ASTM as regards preparation of plates, welding, stress-relieving, radiographic examination, hydrostatic test, and thickness of shell, based on a maximum working stress of 11,000

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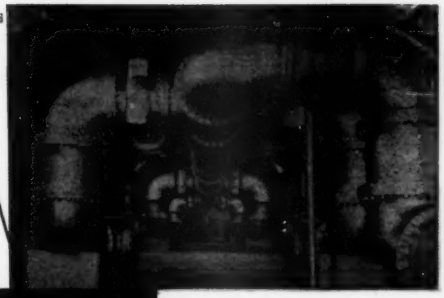

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pounds per square inch, and a pressure head of 650 feet. Except for specials, the pipe was fabricated in 40-ft. lengths, and the field joints were welded, except for three joints provided with Dresser sleeve-type couplings. The pipe was coated with bitumastic enamel and the outside coating covered with a bonded asbestos wrapper. The pipe was laid on an 8-inch bed of sand in a trench of sufficient depth to provide at least 3-ft. cover over the conduit. Before backfilling the trench, the conduit was completely covered with at least 9 inches of sand.

Highway Weed Control
by SOIL STERILIZATION

SOIL sterilization by use of a solution consisting of 25 percent sodium chlorate and 75 percent borax has been used in San Bernardino and Riverside Counties, Calif., for fire hazard weed control since the 1949 season. Thirty tons of the agent have been applied each season under a progressive program, based on the assumption that two successive seasonal treatments would provide sufficient sterilization of the soil so that only spot treatment would be required the third year. The results have permitted an increase in the total mileage treated in the 1950 season.

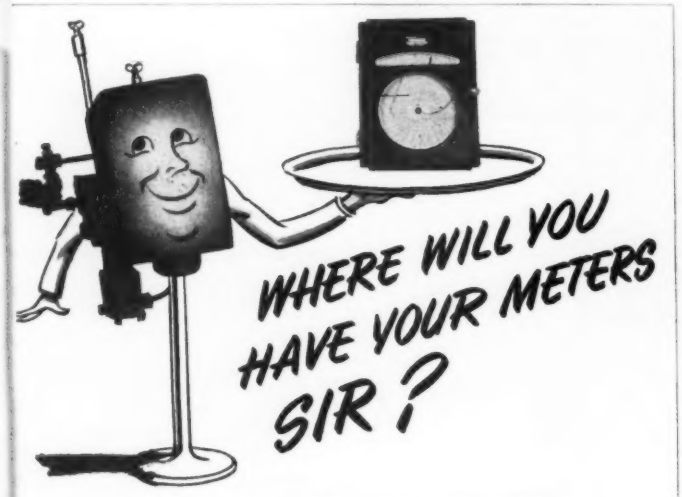
Since the treatment has been satisfactory, it is anticipated that the mileage can be increased again next season without increasing the amount of material used per year. The seasonal rainfall has been subnormal during the past three years; however, the treatment appears to be just as effective at the higher elevations, where the precipitation is greater, as at the lower elevations.

Spraying should be done early in the year and completed before the growing season is hardly begun. This allows the use of the spraying equipment during the off season when it is not needed for oil spraying or watering of trees. The single application per season has the advantage over petroleum sprays in which retreatment is necessary as the season advances and new growth starts. Spraying at this season eliminates fine grass and weed tinder under brush. The brush will die and the leaves and smaller portions will blow off before fire season, in most instances leaving the brush much less inflammable than when green.

The spraying equipment used consists essentially of a three-axle, 2,000-gallon capacity tank truck with an internal agitator and a one-inch pump.

The agitator and pump are powered by a two-cylinder air-cooled engine and can be operated simultaneously or separately as desired. The spray bar is side mounted with an arrangement of swivel joints, pulleys and springs which gives the operator complete control of its position. The bar can be raised, lowered, extended out, pulled in, or tipped by means of ropes running through pulleys. By this mechanism striking obstructions such as signs and posts is avoided and the reach kept parallel to the area to be sprayed, whether it is a cut slope, fill slope, berm or ditch. No harm is done if the bar should strike an obstruction as it is held in position fore and aft with springs which return it to a normal position.

The spray bar itself is a little over four feet long, equipped with



With BUILDERS PNEUMATIC METERS you get "service with a smile": flow information right at the central control panel or wherever you want it. The cost of installing Pneumatic Transmitters and Receivers is repaid day after day, year after year by added convenience and improved flow information! Instantly responsive to flow changes, Builders Pneumatic Meters give you high accuracy metering you can always trust. The system itself is extremely simple and dependable. Instead of cords, cables, floatwells and other space-consuming devices, all connections are made by ¼" tubing: No corner of your plant is beyond the scope of the Builders Pneumatic System. For full information and Bulletins 285-G1 and 285-G2, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 356 Harris Ave., Providence 1, R. I.

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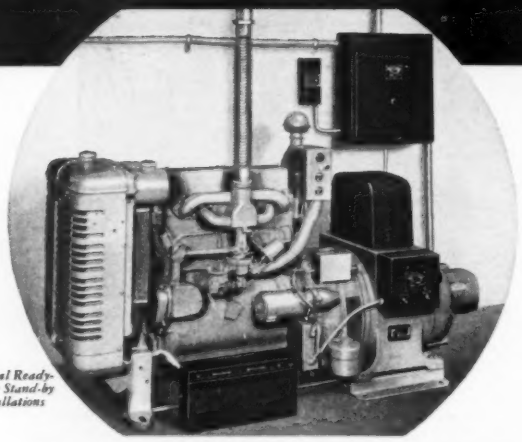

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eight Vee Jet spray tips, and sprays a six foot width evenly. The gauge registers 35 pounds per square inch pressure while spraying. Handrails and a platform are provided on the tank with adjustable safety rails around the platform.

Foaming occurs when some mineralized waters are used for mixing with the chemicals. The foaming can be controlled by adding five gallons, or less, of kerosene or gasoline. The strongest practical solution has been found to be 2,600 pounds of blended chemicals in the 2,000-gallon tank. The tank is filled to the top after all the blended chemicals are in and foaming of the material, if any, has been controlled. The above amount of material will be completely dissolved when properly agitated and no undissolved residue will be left in the tank when the liquid has been exhausted.

In general the solution is applied at the rate of one-sixth gallon per square yard of surface. This may have to be reduced on heavy soils, particularly, if there is considerable moisture in the soil. An average of about two or three 2,000-gallon loads per day is applied, depending, of course, on availability of water distance to job, and continuity of the areas to be sprayed.

The cost of the blended chemicals this season, including tax and freight, was approximately 7.3 cents per pound. The average total cost, including material, labor, equipment rental, operation costs, and supervision per six-foot width of treatment was approximately $75 per mile.

These data are from an article by Harold M. Barnes, Supt. of Dist. VIII, California Highway Department, in California Highways & Public Works.

Sanitary Fill Data

A total of 255,640 tons of garbage and refuse were disposed of by sanitary fill in San Francisco during the calendar year 1949, the latest for which data are available. There were 77,450 truckloads, averaging 3.34 tons each. The average per day was 830 tons. The cost of disposal per ton was 93.8¢. Cover material is brought in from adjacent quarries and spread over the dumped and leveled material to a depth of 18 to 24 ins. The cost of this material was 39.9¢ per cu. yd., and 0.767 cu. yd. was required per ton of garbage and refuse.

PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

SEWERAGE AND REFUSE.. 73
HIGHWAYS AND AIRPORTS.. 79
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THE SEWERAGE AND REFUSE DIGEST

Disposal of Radioactive Waste

Methods for handling radioactive wastes include storage, evaporation, ion exchange, adsorption agents, chemical coagulation, biological methods, or combinations of these methods. All methods of treatment result in a radioactive residue, which must be stored. Storage becomes expensive and unwieldy for large quantities of long-life isotopes, but is the most convenient method for short-life ones. Evaporation is a sure method, but quite expensive. Ion exchange appears to be quite promising in the removal of radioactivity from laboratory wastes. Chemical coagulation is more useful in treating wastes containing single elements; iron and lime treatment appears best, phosphate coagulation is useful in treating water containing mixed fission products. Adsorption agents have limited use. Biological methods are limited to few applications. Treatment of laundry waste in a trickling filter appears to remove plutonium to desirable limits.

John F. Newell and C. W. Christenson — "Radioactive Waste Disposal;" *Sewage and Industrial Wastes*, July.

Sodium Nitrate For Odor Control

During drouth-caused low flow in the San Antonio river last summer and fall, very offensive odors were given off by the river in the downtown section of San Antonio. These were traced to a large brewery which discharged into the river the waste from bottle and keg washing, which was found to have BOD as high as 500 ppm. It was noticed that the odors vanished when the temperature fell and during sunny days. This was accounted for by the fact that putrescible matter in the river settles in deep pools and is decomposed, by aerobic bacteria when there is sufficient oxygen in the water, otherwise by anaerobic bacteria with resulting odors. The river contains a great many microscopic plants, and sunlight causes these to give off large amounts of oxygen through photosynthesis, thus contributing to aerobic decomposition. To provide a continuous supply of oxygen, sodium nitrate was tried. Experiments showed that the odors could be eliminated by adding 150 lb. of sodium nitrate at five points along the odorous section of the river every four days.

Philip N. Albright—"Using Sodium Nitrate for Odor Control in a Polluted Stream;" *PUBLIC WORKS*, August.

Nutritional Requirements In Biological Stabilization

The amount of certain industrial wastes that can be treated successfully in combination with domestic sewage is limited by a deficiency in them of certain nutritional elements essential for bacterial growth, notably nitrogen and phosphorus. The authors made laboratory studies to develop a method of ascertaining the maximum amounts of cotton kiering waste, rag-rope pulping waste, and a brewery waste, that can be treated in mixture with any given domestic sewage by the activated sludge process, and the effect of nutritional deficiencies on that process. They found that if a nutritionally deficient industrial waste is mixed with enough domestic sewage, the nutritional requirements for the stabilization of the waste will be supplied by the excess nutrients contained in the sewage. The average maximum nitrogen requirements for the stabilization of the wastes considered were 5, 6 and 6 lb. per 100 lb. of BOD removed at a temperature of 10°, 20° and 30° C, respectively; and the corresponding average maximum phosphorus requirements were 0.8, 1.0 and 1.0 lb. Mixtures such as those studied can be treated at BOD loadings well in excess of conventional activated sludge plant loadings without appreciable decrease in the percentage BOD removal. Nutritional deficiencies impair the efficiency of the activated sludge, the nutritional requirements of which are directly related to the amount of sludge growth.

E. N. Helmers, J. D. Frame, A. E. Greenberg and C. N. Sawyer—"Nutritional Requirements in the Biological Stabilization of Industrial Wastes;" *Sewage and Industrial Wastes*, July.

Neutralization Of Acid Wastes

Calcium or calcium-magnesium base alkalies are the ones commonly used for acid neutralization. Sodium base alkalies are undesirable where the receiving water is to be used for irrigation, but can be used conveniently and successfully in most other cases if the cost is not too great. Limestones and limes of the dolomitic variety have slower reaction rates than the corresponding

high-calcium varieties, but a given weight will neutralize more acid than the corresponding high-calcium material. Before purchasing limestone it should be tested; each limestone has a different neutralizing value, depending on the total amount of active material present and the ratio of magnesium to calcium in the stone. The neutralizing agent which will be best for a given case will depend on the volume, kind, and quantity of acid to be neutralized, on the cost of the equipment required, and on the availability and cost of the alkalies obtainable.

H. L. Jacobs—"Neutralization of Acid Wastes;" *Sewage and Industrial Wastes*, July.

Determination of Free Cyanides

Determination of free cyanides in sewage and polluted wastes, has been one of the analytical methods that has provided the analyst with serious difficulties, especially in small concentrations. After investigating the methods previously used, the authors concluded that, by means of a modified pyridine-benzidene reaction with cyanogen halides, free cyanide may be determined directly in sewage or polluted waters in the range of 0.02 to 0.5 ppm with a reasonable degree of accuracy and with little interference. The range may be extended by diluting samples with greater concentrations or using a large sample for lower concentrations of CN. Thiocyanates may be determined similarly. The reagents are simple to prepare, stable, and readily available.

I. Nusbaum and Peter Skupeko—"Determination of Cyanides in Sewage and Polluted Waters;" *Sewage and Industrial Wastes*, July.

Treatment Plant For a Small Community

Onamia, a Minnesota community of about 700 population, with a small creamery contributing to its sewage, needed a plant that would remove 85% of the organic matter at minimum cost. The peak flow is approximately 125 gpm, but 200 gpm was adopted as a design basis, to provide a 20-yr. basis for financing, to provide for an additional small industry, and because this 60% increase in capacity would add but 10% to the cost. Two unusual features of the plant are a very small primary settling tank, and chemical treatment of the sludge instead of digestion. The plant contains a bar screen, primary and secondary settling tanks, sprinkling filter, a recirculating pump, sludge pump, chemical mixing tank, and sand beds. Both settling tanks are Spiraflow. The primary tank is 12 ft. in diameter and 10 ft. deep, designed to remove only that material that would plug the filter, which is an aerofilter with medium of prefabricated tile. The size of the final settling tank is such as to provide an overflow rate of 800 gal. per sq. ft. inside of the skirt. It was calculated that the cost of chemical treatment, including principal, interest, upkeep, chemicals and obsolescence, was about one-half the cost of digestion, and treats milk and blood wastes without difficulty. The treatment consists of adding anhydrous ferric chloride at the rate of 2 lb. per 100 gal. of sludge and rapid stirring for 20 seconds, after which the sludge is passed to sand beds.

Robert J. Ellison and Randolph L. Smith—"Unusual Design for Small Waste Treatment Plant;" *PUBLIC WORKS*, August.

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Sewage Treatment In Kentucky

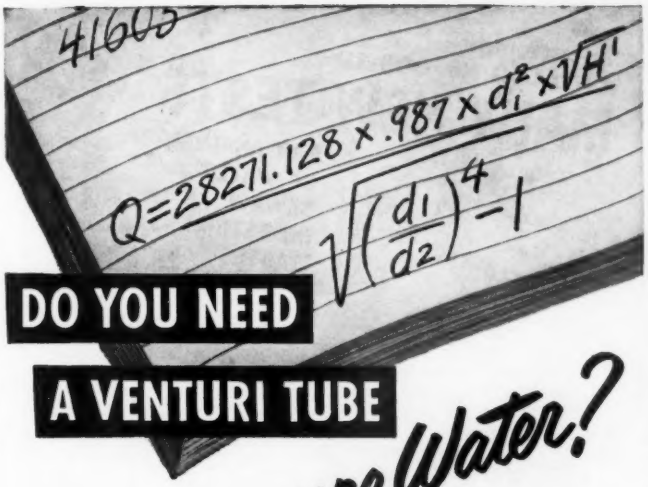
In designing sewage treatment plants for Kentucky municipalities, where discharge is into large streams, initial efforts are directed toward primary treatment. Where the streams are small, complete treatment is being provided. A general analysis of all the plants in the state shows that 54% use hand-cleaned bar racks, and 1 mechanically cleaned. Grit chambers are used by 38%. Comminutors by 35%. Sludge removal equipment is used in primary settling tanks by 70% and in secondary settling tanks by 20%. Flocculating equipment is used in 41% of secondary plants. Of all types of filters, 60% are standard-rate, 31% are high-rate, and 9% are contact beds. Rotary distributors are used on 84% of the standard-rate filters, and fixed nozzle distributors on 16%.

Pre-aeration tanks serve also as air-flocculation chambers when chemical treatment is required during periods of low river flow. Since World War II, 86% of all filters constructed in Kentucky have been high-rate. All but one of the sludge beds in the state are open; it is believed that during the many months of high humidity experienced in that state, sludge under glass does not dry any better than on open beds. Where chemicals are used, lime and iron are favored; ferric sulphate and hydrated lime for smaller plants, slaked lime for the larger ones.

J. Stephen Watkins—"Kentucky Sewage Treatment Plants Reflect Progressive National Design Trends;" *Civil Engineering*, July.

Sewer Rentals in New York City

In carrying out the $300,000,000 program for treating New York's sewage, the cost of this, together with that of operation and the legal debt limitation have presented an increasingly difficult problem, which was solved by the passage, in July 1950, of ordinances providing for the collection of separate sewer charges or "rents". These require "the owner of any parcel of real property connected with the sewer system" to "pay a sewer rent or charge for the use of the sewer system . . . based on the water supplied to any such real property as measured by the amount charged for such water;" the sewer rent to be one third of the charge for water supplied. Pro-



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vision is made for allowance for water that does not reach the sewers, and for water reaching the sewer that is not paid for in the water bill. Unpaid charges may be a cause for shutting off the water supply and become a lien on the property. The revenues from sewer rentals must be used for paying "the cost of the management, maintenance, operation and repair of the sewer system, the cost of administering and enforcing the provisions of this law and the cost of collection of the sewer rents or charges." Any surplus is to be used for payment of the interest and amortization of any debt incurred for construction or enlargement of intercepting sewers or disposal works. Normally these rentals would total about $15,000,000 a year, but the campaign for water conservation last year may reduce the total this year to about $14,000,000. "The adoption of sewer rentals has been accepted by the public with a minimum of protest."

Richard H. Gould—"Progress Report on Sewer Rental for New York City," *Sewage and Industrial Wastes*, July.

Helminthic Decontamination Of Sewage-Contaminated Vegetables

Removal or kill of coliform organisms and disease - producing organisms does not necessarily mean that ascaris eggs, which have a great resistance to natural environmental conditions, are removed or killed also. Results of experiments showed that the eggs adhere tenaciously to solid surfaces. Various detergents and germicidal rinses were found not to be effective killing agents, but cationic detergents will cause more than 90% removal of eggs from smooth surfaces, such as tomatoes. The removal is less effective when cracks, crevices or bruises protect the eggs. The only effective method to insure vegetable decontamination with respect to helminth eggs is immersion of the vegetable in warm water (55° to 60° C) for 10 min. This does not alter the appearance or character of the vegetable.

This is the fifth of a series of papers treating of the contamination and decontamination of vegetables grown in polluted soil.

Willem Rudolfs, Lloyd L. Falk and Robert A. Ragotzkie—"Contamination of Vegetables Grown in Polluted Soil;" *Sewage and Industrial Wastes*, July.

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Air Diffusion—A Versatile Tool for Sewage and Industrial Waste Treatment. By *Frank C. Roe*, The Carborundum Co. July, Pp. 825-832.

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Reno Modernizes Plant for Biofilter Treatment. By *R. D. Brown* and *W. W. White*, Nevada State Dept. of Health. August, Pp. 410-412, 442.

Treating Sulphite Waste Liquor—One Problem, Many Answers. By *Geo. W. Gleeson*, Dean of Eng., Oregon State College. August, Pp. 415-417.

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Some Miseries of Cleaning a Large Digester. By *Geo. M. Scheller*, Supt., and *Geo. F. Fynn*, Chf. Chem., Buffalo Sewer Authority. August, Pp. 362-366.

Settling Tank Design. By *F. Poepel*, Prof. of Mun. Engr., Tech. High School, Stuttgart, Germany. August, Pp. 367-369.

Results of North Carolina's Highway Survey

During the year 1950, the State Highway and Public Works Commission of North Carolina made a comprehensive survey of the needs of the rural segments of the routes on the Primary Federal Aid System, totalling 4,085 miles. The Commission's engineering staff, on the basis

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of this survey, presented a report of the needs, as of Jan. 1, 1951, to serve adequately the demands of existing traffic and permit future expansion. They report that 2,815 miles need improvements, including right-of-way, grading, surfacing and structures. The estimated cost is about $306,000,000.

To collect the data needed in addition to that already in the records, special survey cars were equipped with instruments which logged every mile, recording length, curvature, sight distance, etc., each car covering about 60 miles per day. It would have been impracticable for the engineers to write by hand all of the information obtained while traveling at this rate, so the data were dictated into portable voice recorders.

For determining what improvements are needed, the average basic speed was set at a minimum of 45 mph; and on this basis, a set of "tolerable standards" were prepared, covering traffic volumes, sight distances and widths. The estimate of total cost of improvements was as follows: Right-of-way, $49,364,100; grading, $77,678,400; surfacing, $115,580,600; structures and bridges (and interchanges), $62,834,500. As an illustration, there was recommended for Iredell County: Add two lanes, divided, and resurface existing lanes on 9.6 miles; add two lanes, not divided, and resurface existing lanes on 4.0 miles; reconstruct present lanes on 7.2 miles; relocate, providing R/W for 4 lanes, divided, and build two lanes on 11.5 miles; provide R/W for 4 lanes, divided, on 7.2 miles; relocate 3.5 miles; reconstruct 7.2 miles; provide R/W for four lanes, divided, and reconstruct existing lanes on 9.8 miles; and widen to improve curvature, sight distance, shoulders, etc., on 10.4 miles.

Talking Traffic Lights

Talking traffic lights are the latest wrinkle in England. They were developed by Ministry of Transport traffic experts to guide pedestrians. They are demonstrating models that synchronize light and sound. When the signal changes from red to amber, a voice says: "Wait for it." When it switches from green to amber, the voice warns: "It's a bit late to cross." Talking lights will probably be installed at corners where many children cross. To insure warnings will be understood, signal voices are in local dialects.

PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Field Test of Soil Moisture

Several field test methods of rapidly determining soil moisture include alcohol drying, alcohol extraction and pycnometer methods. An English manufacturer has brought out a "Speedy Moisture Tester," the accuracy of which is said by the Road Research Laboratory to provide "accuracy fully satisfactory for normal field requirements." In this method a known weight of the wet soil is mixed in a sealed chamber with finely-ground calcium carbide. The gas pressure generated in the chamber is recorded on a pressure gage, calibrated in terms of moisture content. A test requires 5 to 10 minutes.

D. Croney—"Rapid Measurement of Soil Moisture Content in the Field;" *Roads and Road Construction*, July.

Highway Signs For United Nations

There is quite general use of a standard system of road signs in the United States and most of the Americas; and of a different system, adopted in 1931 as the "International", which is used by nearly all the other nations of the world. A committee of United Nations is endeavoring to adjust the differences between the two so as to develop a single standard to which all nations would agree. One of the main differences is that the United States employs both symbols and lettering while the International standard uses only symbols on most of the signs. Other differences are in the color schemes used, and the shapes of the signs. Tests for comparing these two standards and also that used in Central and South Africa are being conducted, 24 signs being used, 4 standard and 4 standard with variations for each system. New York State, on April 5, 1951, erected these signs on both sides of an 8-mile length of U. S. 20 in Erie County, so spaced that no two signs were in view at any one time. During the 3-week period beginning April 9th, more than 400 observers of all ages, pursuits and other differences were driven by these signs at 50 mph during the day and 40 mph at night, during all kinds of weather, the distance from each sign at which the shape could first be recognized being noted, and that at which the message could first be read. Three other States have conducted tests of the same signs, and similar tests on similar signs are being run in foreign countries.

Charles R. Waters and Gilbert W. Treble—"Tests of Highway Signs for United Nations;" *Traffic Engineering*, July.

Courtesy Traffic Engrg.

Highway signs for the UN.

Rubber-Asphalt Surface Dressing

After trial on a test section, 1½ miles of trunk road in England are being surface-dressed, using asphalt of 60-70 penetration to which had been added 2½% by weight of rubber powder. The mixture was heated with constant agitation for 3 hr, at 300° F, after which light creosote oil was added. This was distributed on the road at 0.2 gal. per sq yd. and covered with ¾ in. stone chips at 25-30 lb. per sq. yd., and consolidated with a 10-12 ton roller. The rubber-asphalt is said to be superior to ordinary asphalt in adhesion to both road surface and aggregate. The cost is greater, but is expected to be more than justified by the additional life.

"Rubber Bitumen Surface Dressing;" *Municipal Engineering*, July 27.

Transposed Traffic Lanes Proposed for Turnpike

An unusual plan for a projected turnpike has been proposed to the Ohio Turnpike Commission by its consulting engineers, the J. E. Greiner Co., as a safety measure. The two eastbound lanes would lie north of the two westbound, separated from them by a 40-ft. median zone and a 10-ft. shoulder on each side. The slow lanes would be next to the median and the fast ones on the outside. This would separate the high-speed lanes by 84 ft.

The median zone would slope to a central ditch 4 ft. or more below the pavement level. This would eliminate U-turns to the left; if made, they would be to the right, from one slow lane to the other. The wide, depressed median would trap vehicles out of control, lower the ground-water under the pavement, and facilitate disposal of snow. All gasoline and service stations, restaurants, etc., would be placed in the median zone, widened

at such points, and be accessible to all traffic without crossing a high-speed lane. Interchange lanes would be located in the median zone, widened to about 750 ft. for that purpose. Of several authorities questioned as to their opinions of the plan, most believed it would be confusing to motorists. The advantage of the wider median zone was recognized, but the disadvantages of the plan as a whole were thought to outweigh the advantages.

"Transposed Traffic Lanes Proposed for Ohio Turnpike;" *Engineering News-Record*, July 26.

Gutters in Street Centers

The author, city engineer of Northampton, Mass., where the plan has been put into practice, recommends that on residential streets in which there are storm sewers, the use of the inverted-crown cross-section be considered. In this, the catch-basins would be in the center of the street, reducing their number by about 50%, and also reducing the length of the basin connections. In fact, there may be no such connections: and the basins may serve also as manholes. The clearing of snow from catch-basin openings would be eliminated, since they would be cleared automatically when plowing the roadway and would be kept clear by traffic. There would be no obstructions to flow of water to the catch-basin, as occur in gutters. The problems of driveway entrances, and of gutters crossing intersecting streets, would be largely eliminated. There would be no splashing of pedestrians with gutter water. To the objection that such cross-section would cause vehicles to slide together, it is answered that this does not happen at the sides of crowned roads. When thaws come the entire roadway would be wet continuously, but the author answers that this is the case with present construction. Catch-basin covers would be set carefully flush with the pavement and be no more obstruction to traffic and snow plows than are the present manhole heads.

John C. Keefe — "Tomorrow's Street—Should It Have a Valley Gutter?;" *American City*, August.

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Canadian Pavement Design Defended. By *Norman W. McLeod*, Eng. Consultant, Canadian Dept. of Transport. Aug. 9, Pp. 35-38.

Public Roads

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Hourly and Daily Variation in Vehicle Speed on a Rural Highway. By *Robert L. Meyer,* Assoc. Engr., Nebr. Dept. of Pub. Rds. July, Pp. 343-345.

Traffic Paint Preferences and Requirements

ESTIMATED quantities of white and yellow road marking paints used in 1949 and 1950 by 33 states indicate that about 11 percent more whites and about 9 percent more yellows were used in 1950. The ratio of white to yellow was about 7 to 3 for both years. These and the other data herewith are based on a survey by G. W. Ashman, of the New Jersey Zinc Co., covering 34 state highway departments and 175 paint manufacturers. The results of the survey were presented at the 1951 meeting of the Highway Research Board.

A marked increase in the use of retro-reflective road markings is indicated by the returns. The reported estimated consumptions for 1949 and 1950 indicate that 67 percent more beaded whites and 59 percent more beaded yellows were used in 1950 than in the previous year.

In types of opaque white pigments preferred, both the states and the manufacturers rate titanium pig-

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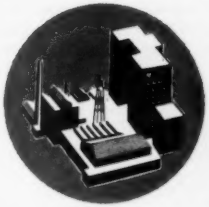

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ments, first, followed by zinc oxide and lithopone. Among the extender pigments, magnesium silicate definitely has first preference.

Preferences on vehicle types selected indicated no significant change between the types used in 1949 and in 1950. About half of both groups reporting indicated a preference for the alkyd resin types, and about a third of both groups reported a preference for the phenolic resin varnish types. The phenolic varnish-dispersion resin type was voted as third in importance, being somewhat more popular among the states than among the manufacturers.

Both the highway departments and the traffic paint producers indicated the relative importance of those paint properties that will receive greater emphasis during the future. A summation of these preferences, both on a first-choice basis and on a weighted basis, indicates that both groups have voted "improved service life" as definitely first in importance. There was decidedly less unanimity of opinion on the relative importance of the other properties. Apparently, the highway departments desire better visibility and better film properties and do not stress "cost per gallon", while the manufacturers are emphasizing improved liquid paint and application properties while rating "cost per gallon" as quite important.

Trench Backfill WAS a Costly Headache

W. V. CORNETT,
President, R. P. B. Corporation

ONE day in 1933, a city engineer in Southern California stood beside an open ditch. What he saw, as he stared up the ditch line, caused a look of frustration to pass over his face. A thousand feet of pipeline lay uncovered. Cars crawled, bumper to bumper, up the torn street. Backfill lagged as a labor gang dragged a hose and jet pipe along the ditch. Coupled with what he could see was a disturbing thought in the engineer's mind: How much would the flooded backfill settle in the next few months?

He had his answer in less time than he expected. It settled plenty. It created a costly "go back" job to add more dirt and to repair the settled pavement areas.

The problems peculiar to that situation persisted for nearly two decades before they were solved. They defied mechanical engineers; they mocked soils engineers. Sheepsfoot rollers were highly effective on open fills, but were useless when the area was small. Back in 1920, when W. V. Cornett was the firm name of a road grading contractor, we noticed that wherever we had to break pavement over trenches which had been backfilled by flooding, there was practically always a void where the subgrade had sunk. These voids were often from 3 to 5 inches deep, with the pavement slab entirely unsupported. It was impossible to miss the implication: A better tamping method was needed. This fact was proven by modern testing equipment. The bureau of Inspection of the City of Los Angeles found 33%

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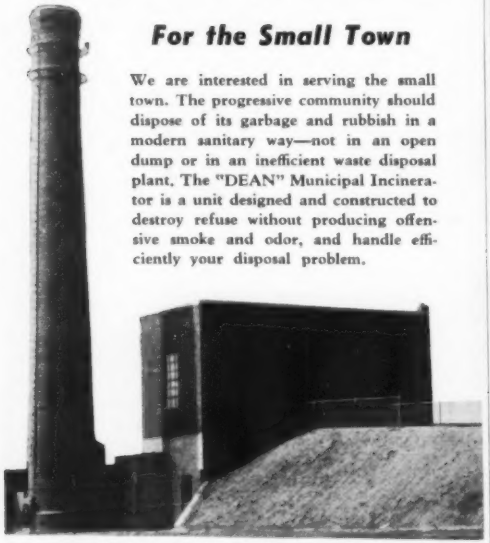

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moisture remaining in a flooded trench 120 days after the water had been applied. This soil, an adobe, could be tamped into a laboratory mold to a density of 110 pounds, dry weight, per cubic foot; 78 pounds per cubic foot, less than 71% of possible, was the best that flooding could do. The Los Angeles report also showed how flooding weakens the saturated area, so far as pavement bearing support is concerned.

Breaking and Compacting

The generally increasing weight of pavements made breaking them more costly and difficult and we started development of a machine that could perform this work quickly and economically. This unit was perfected more than a decade ago, but its application to the compaction of small areas was still an unsolved problem. Now, the "Mighty Midget", a logical development of the pavement breaker and designed for use in confined trenches, around dam abutments and core walls and in other restricted places, is revolutionizing this field of engineering. Density determinations made by the Modified AASHO methods show, when using this machine, consistent results of 90%, with some tests passing this figure and very few failing to reach it. In granular soils, the impact tends to vibrate the formation, usually setting up a belled cross section of increased density outside of the trench limits. In plastic soils, the machine is especially effective if the moisture content is controlled at the optimum.

Backfill properly compacted by this machine makes a permanent and finished job. One of the large utility companies, for whom the contracting branch of our organization does occasional work, says that this modern dry-tamping technique has virtually eliminated their "go-backs" so far as sinking and settling are concerned. When they used other methods, including flooding, they were spending $75,000 a year on "go-backs", and failures were running as high as 64%.

Recommended Procedure

Interesting to us was the experience of Glendale, Calif. When this city eliminated the old method and called for modern deep tamping, haul-away costs for excess dirt dropped appreciably. The expense of temporary paving was eliminated entirely. The tonnage of asphalt for resurfacing the trench area to street level was reduced 33%. It was found that soil properly compacted by this machine would not be compacted any further when 12-ton rollers were used on the asphaltic concrete surfacing. Extra material was not needed; the theoretical amount was enough.

The best method we have found for tamping over gas, water and other utility lines is also the easiest. After the pipe has been laid, we fill to the spring line with sand. An 18-inch soil layer is then put in, watered if necessary, and tamped by the Midget. A finish lift 18 inches deep then goes in and is tamped, then a finish course, followed by pavement replacement, completes the job. Three tamping passes on the average job get 90% density. The machine needs only one operator and a 160-ft. air compressor, which it can tow, to tamp 1,000 ft. of average utility trench, with 25 to 30 bellholes, in an 8-hour day.

The immediate and permanent compaction that results often makes it possible for a contractor to keep his job closed up tight to the trenching machine each night, especially

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in rainy weather. If the superintendent will arrange for the tamping crew to start work later and finish later than the trench excavation and pipe laying crews, he need pay no extra labor costs. Such an arrangement may permit contractors to average more working days per week and take more jobs per year without increasing supervisory or office organizations; and it may also result in markedly better traffic conditions on streets under construction, thus benefiting cities in another way.

Report on Tennessee Water Systems

THE annual survey of Tennessee water systems and their rates for service, recently completed by the State Planning Division of the Tennessee State Planing Commission is the basis for the conclusions here presented. The survey obtained returns from 166 water systems operating in the state, including municipal enterprises, private systems, and those operated by utility districts. This represents 86 per cent of those systems not developed primarily for industrial and commercial use. Systems not represented in the survey are in most cases small ones servicing less than 1,000 population. Complete data on the findings of the water utility survey as well as information on sewer charges and garbage collection fees will be published shortly under the title, *Sanitary Service Charges in Tennessee, 1950-51*, by the Tennessee State Planning Commission.

Improvements to the physical plants of local water departments have been especially notable during the past two years. Only 18 per cent of water systems in the state now fail to administer treatment, although 1948-49 data show 23 per cent providing no treatment, and the first survey made in 1947 indicated that 24 per cent of local water systems did not treat their water previous to distribution. Similarly, the percentage of local water systems administering only disinfection has dropped steadily, from 38 per cent in 1947 to 35 per cent in 1948-49, and to 34 per cent as of the present date. This indicates that 48 per cent of all local water systems in Tennessee currently give more than simply basic treatment to their water prior to distribution. Additional treatment administered includes filtration, disinfection, coagulation, sedimentation, iron removal (particularly in West Tennessee), and corrosion control.

Wells and springs comprise 78% of the major sources of Tennessee water supply, and this, to a degree, accounts for the fact that the percentage of systems administering treatment is not higher; water from these sources ordinarily requires little in the way of treatment to render it safe. Streams and lakes provide the source for 14% of local water supplies, while the remaining 8% of the systems obtain their water from impounding reservoirs, or are served by other systems.

A majority of Tennessee water systems meter their water. Of the systems studied, only 14% wholly lack meters and make flat rate charges to their customers. A few additional cities meter only their industrial and commercial customers, using flat rates for domestic consumers. However, only three cities of over 3,000 population in the state employ a flat charge for any portion of their customers, and only one of these cities fails to meter water for commercial and industrial use. Rates for water service vary radically between cities.

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In the Model SC, which is a diatomite filter utilizing hollow discs covered with prefabricated media as the filter element, design and construction eliminate by-passing and channeling. Cleaning of the filter is accomplished by a simple but positive mechanical means that employs an opposed set of nylon brushes to clean both sides of each disc. Then, only a minimum amount of wash water is needed to carry away the discarded cake.

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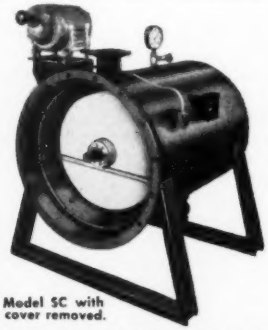
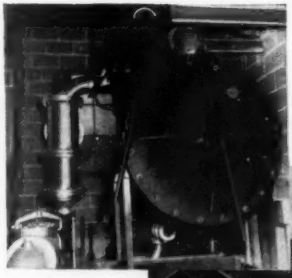


Model SC with cover removed.



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"Water Meter Repair Shop:" *American City*, August.

Fluoridation in New York State

Fluoridation of public water supplies is recommended by the New York State Dept. of Health, subject to certain control measures. The local health officer must definitely support the program; accurate feeding equipment must be provided, with protection for the operator, and adequate control by laboratory tests and a trained operator. Sodium fluoride is convenient to use, but because of shortage of supply, sodium silicofluoride may be used. Sodium fluoride may be in the form of a very fine powder weighing about 38 lb. per cu. ft., or a coarser material weighing up to 90 lb. The feeder must be chosen suitable to the kind of fluoride to be used. About 4 lb. of this will dissolve in 100 lb. of water, but the use of 1 or 2 lb. is common.

Two grades of sodium silicate are available—one weighing 72 lb. per cu. ft. and another weighing 55 lb. The solubility is low—about 0.43 lb. per 100 lb. of water at 32° F. A slurry of 10% to 20% may be used. About 14 lb. of sodium silicofluoride is necessary for each ppm per mg of water. In handling fluoride compounds, operators should wear respirators and rubber gloves. If the water is to be softened or coagulated, this should be done before the fluoride is added.

"New York Fluoridation Policy and Procedures:" *PUBLIC WORKS*, August.

Diatomaceous Earth Filtration

Los Angeles, Calif., in considering means for filtering about 100 mgd of its water supply, studied the practicability of using diatomaceous filtration. One reason was that there was not available an area sufficient to contain the required slow sand filters; another was that the head required for operating such filters would necessitate pumping. Abundant data on small diatomite filters are available, but none for designing a plant of this size. Extensive experiments indicated that this process can produce, without the use of chemicals, effluents whose quality, from a physical standpoint, compares favorably with those from slow sand filters. For average water quality conditions, the total cost of treatment per unit volume will be very nearly the same for both types of filter. If space for the plant is limited, or if slow sand filtration would require pumping, as in this case, the diatomite process has a decided advantage. If the water carries large loads of suspended matter, or requires considerable treatment with activated carbon, these conditions favor conventional filtration. If operating procedures can be so improved as to lengthen filter runs without sacrificing quality of effluent, this will not only reduce filter aid cost but will also increase the effectiveness of the process for the treatment of water which contains taste and odor and therefore requires use of powdered activated carbon.

The following points were brought out by the investigation: Dissolved or entrained oxygen in the water in concentrations up to almost 4 times normal has no significant effect on performance of diatomite filters working under pressure. Diatomite filter aids are available commercially in more than 10 grades of porosity, and a grade can be selected that will give the maximum rate of flow consistent with the desired clarification. An amorphous aluminum silicate powder containing 70% silica and 30% aluminum oxide appeared to be more easily reclaimed than diatomite and require smaller doses by weight, but is expensive. Wood pulp products tried did not seem capable of producing effluents of equivalent quality. With an average total filter aid requirement of 100 lb. per mil. gal., a 100 mgd plant would require 5 tons of diatomite, which would have to be disposed of in addition to the suspended matter removed from the water.

Joseph M. Sanchis and John C. Merrell, Jr.—"Studies on Diatomaceous Earth Filtration:" *Journal, American Water Works Ass'n*, July.

Mechanical Equipment For Laying Pipe

For trenching, two distinct types of equipment are available—trenchers specifically designed for such work, and the power excavator of the boom and single bucket type. The trenchers may be either wheel or boom type, and are usually crawler mounted. Machines of the second type operate a shovel, trench hoe, clam shell and drag line, are adaptable to all kinds of excavating work, and can be used as cranes. Buckets from 15 in. to 42 in. width are obtainable. Rubber-tired wheel-mounted units cost more than crawler-mounted. Prices for the latter in 1950 ranged from $7,500 to $10,000 for ⅜-yard, $10,000 to $13,000 for ½-yard, and $13,000 to $21,000 for ¾-yard. For digging, the author uses an air-operated clay

spade operated by a 30-cfm air compressor, mounted on a 2-wheel trailer. An air-operated drifter drill is used by many large companies for installing ¾-in. and 1-in. service pipe; pipe-pushing machines by smaller companies. For handling pipe, hydrants and heavy fittings, some form of frame, attached to the body of a truck on which a winch or chain hoist is mounted, is used; or a small hydraulic crane, which is very handy and easy to operate. For tamping backfill, use is made of air-operated tampers, either of the independent type or involving using a paving breaker with a tamping pad.

J. G. Carns, Jr.—"Use of Mechanical Equipment in Laying Pipe;" *Journal, New England Water Works Ass'n.*, June.

Determination of Hardness in Water

The Schwarzenbach method of determining hardness is about twice as rapid as the standard soap titration and as accurate as the standard analytical methods. The method consists of titration with a solution of disodium dihydrogen ethylenediaminetetraacetate, which forms stable complexes with calcium and magnesium ions. In the pH range 8 to 10, the dye Eriochrome black T, used as an indicator, shows a sharp color change from red to blue at the end-point of the titration. The method is precise to 2 ppm or better, takes about half the time required for a soap titration, and is directly applicable over wide ranges of hardness. It is not adversely affected by high concentrations of many types of dissolved salts. The temperature of the solution has little effect. There are only a few substances which interfere and the disturbance they cause can be eliminated by simple modifications in the standard procedure.

J. Carrell Morris—"The Schwarzenbach Method for Determination of Hardness", *Journal, New England Water Works Ass'n*, June.

Large Australian Water Pipe Line

The Warragamba, New South Wales, water supply project includes 17 miles of 106 in. and 84 in. steel pipe, requiring more than 20,000 tons of steel. In constructing the pipe, all welding (except for special pipes and bends) is performed using automatic submerged arc welding equipment. As soon as the internal and external butt welds have been completed, the joints are tested to 16,000 psi steel stress. The pipe is then acid pickled, washed, and treated in a phosphoric acid bath. After drying, it is coated on the outside with a thick zinc base preparation and oven baked at 400° F, which gives a hard coating with excellent corrosion resistance. The inside surface of the pipe is coated with bituminous material and metal screenings, followed by a 1½ in. layer of concrete which is applied centrifugally and bonds excellently with the screenings. This concrete consists of 1 part of cement to 1.4 parts of sand, and 2.8 gal. of water per cu. ft. of cement.

"Production Line Methods Speed Large Australian Water Pipeline;" *Engineering News-Record*, July 19.

Dry Ice for Freezing Mains

Dry ice has been used frequently for freezing a plug in a service pipe to permit repairs. Hickory, N. C., wishing to replace several old fire hydrants whose 6-inch branch pipes had no valves, tried the dry ice method on these 6-inch

Common sense design assures easy operation
The stuffing box plate, cast integral with the head, combines with the packing and bronze stuffing box nut to seal off the operating thread. Nothing—water, sediment or ice—can reach the thread to damage it or hinder its operation. Winter or summer, the Mathews Modernized Hydrant is *dependable*—an important factor in neighborhood safety.
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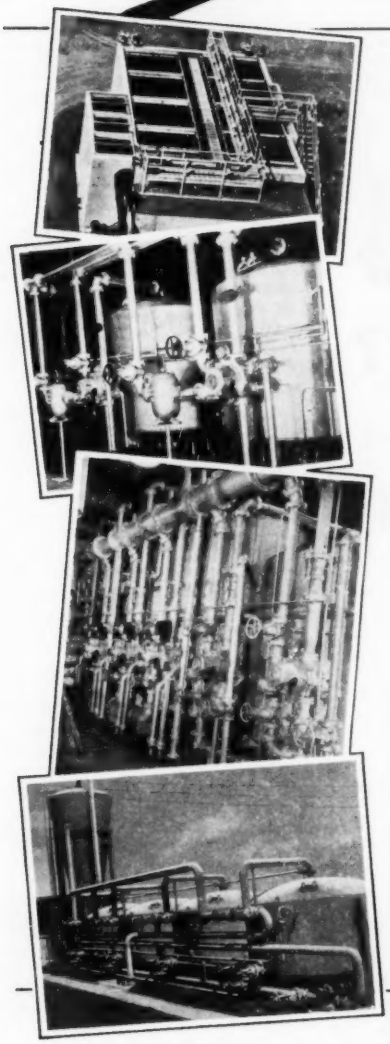

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pipes. After some experimenting, they found that a tight plug could be made by packing around the 6-inch pipe 62 lb. of dry ice pulverized and mixed with 4½ qt. of gasoline; the latter being added to cause close contact of the dry ice with the pipe. A tight plug was formed in about 1¾ hr. For 2-inch pipe they use 2 lb. of dry ice and 1 qt. of gasoline. Small supplies of dry ice they obtain from local dairies; large supplies from a chemical-supply firm.

A. B. Uzzle, Jr.—"Dry Ice Freezes 6-Inch Main;" *American City*, Aug.

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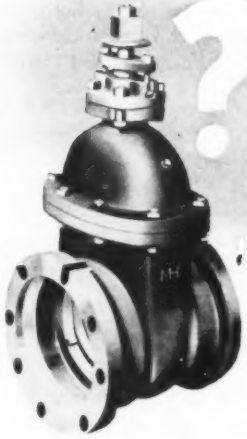

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Long Radius Ell Speeds Pipe Cleaning

ARTHUR ROHMAN

A LONG-radius ell developed by the Southern Counties Gas Company of California, Los Angeles, is a new pipeline construction feature designed to facilitate pipeline cleaning operations. This ell is being used in building the Southern Counties portion of loop lines which will boost the capacity of the more than 100-mile pipeline between the LaGoleta underground storage field north of Santa Barbara and the Los Angeles metropolitan area. Completion of the looping projects being constructed by Southern Counties and Southern California Gas Companies will boost deliveries through this line by 40 million cubic feet daily.

The effectiveness of the sweeping turns in the Southern Counties portion of the project will be tested, as the line is scheduled for cleaning before being put into operation. This procedure, which was followed prior to putting the recently completed San Diego line into service, consists of cleaning the pipe in sections of from two to ten miles using "pigs" or "go-devils" manufactured by the T. D. Williamson Company of Tulsa. Ordinarily, to obtain full cleaning effectiveness of the wire bristles on the "go-devil", it has been the practice to push the "pig" through the line at pressures ranging from two to five pounds. At times the "pig" has a tendency to slow up or become caught in the line, and this is especially true at sharp right angle turns.

When this occurs it is necessary to boost the pressure, sometimes up to 10 pounds. Obviously, the control of the velocity of the "pig" is then more difficult, since the higher pressure propels the "pig" forward with great rapidity once the bend is cleared, reducing the effectiveness of the cleaning device.

Locating the "Pig"

Location of the "pig" in the line is obtained through the use of a 500-milligram capsule of radium placed in a removable cap on the "pig". A Geiger Counter and an operator from the X-ray Engineering Company stand by at all times to locate the "pig" in the event it should become stuck.

The long-radius ell was an idea conceived by Charles F. Briscoe, manager of engineering services for Southern Counties, to solve this particular problem. The Ladish Corporation, a drop forge concern located in Cudahy, Wisconsin, was requested to develop the ell.

The radius of the new ell is three times the diameter of the pipeline under construction. In the case of the 20-inch La Goleta line, the radius is 60 inches. The radius previously used was one and one-half diameters, or in the case of 20-inch pipe, 30 inches. Thus, the sweeping turn of the pipeline permits the passage of the cleaning "go-devil" with a relatively constant gas pressure and speed.

Corten type steel, a recent development of the U. S. Steel Corporation was used by Ladish in the fabrication of the new type ell, the greater physical strength of this steel making possible the use of thinner-walled tubing than the seamless grade "B" formerly used. The new product is rolled from sheet steel of absolutely uniform

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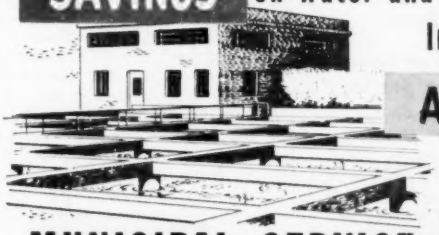

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thickness into true-circle tubes that will fit into a pipeline wherever required. A secondary advantage is that the new ells can be cut into segments of any length that can be welded into the pipeline at any point.

The work to be completed consists of two 17-mile loops of 20-inch pipe to be tied into the original LaGoleta pipeline built in 1944. The increased capacity of 40 million cubic feet per day places the two Los Angeles operating companies in a more favorable position with respect to constantly increasing peak load requirements. Long range plans call for the construction of additional 20-inch loops, so that eventually the lines now being completed will become part of a separate line extending from LaGoleta to Los Angeles.

Water Rationed at Four Gallons per Capita per Day

East London, South Africa, in April, 1949, found itself, at the beginning of the dry season, faced with a reservoir supply that was estimated to be sufficient to furnish an average of only 4 gallons per capita per day for Europeans and 3 gallons for natives. The city council ordered consumption to be confined to this, and this was enforced in the early days by reading the household meters every other day. Consumers were advised to remove, or render temporarily useless, all fittings in the premises except one tap. Meantime the department tested the mains thoroughly for leaks. Each industry was allowed a quota on its activities, and its supply cut off as soon as the quota for the month had been reached. The daily consumption for 200 days, from April to October, averaged about 600,000 gals, and fell to 190,000 gals. one Sunday. In January before the rationing began the daily average consumption was about 3,000,000 gal. The regular supply was eked out by using sea water for toilet flushing, dish washing, etc.; rainwater tanks (sold by the Council at cost) were used to collect rainfalls. A sea water bath was opened to the public free of charge. The city obtained 160 Army canvas tanks of 500 gals. capacity, placed them 1/3 mile apart and filled them by road tankers. Passenger and cargo vessels brought in about 9,000,000 gals. that was used for steam raising. The government offered the use of a new oil tanker which had never been used, which brought in 54,800,000 gals. in 17 trips during 13 weeks. This was stored in five 1,000,000-gal. oil tanks of a local oil company after they had been cleaned with steam and hot sea water.

At one time, before the oil tanker was obtained, serious consideration was given to the advisability of exacuating a large proportion of the population. During the whole 200 days water was delivered under pressure for the full 24 hours daily. The city suffered financially, not only spending £173,600 on emergency measures (including the operation of the tanker) but losing a large part of the customary revenue from water rates, some families using as little as 7 cents worth of water per month.

Design Factors for the Oklahoma Turnpike

The sub-base for the Oklahoma Turnpike will be 16.5 ins. thick. Three asphaltic and two cement concrete types of surfacing have been approved. The asphaltic specifications provide for an 8-in. surface

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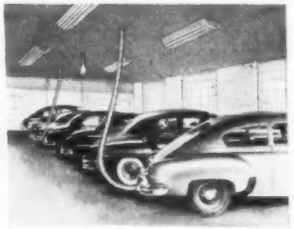

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So far, construction has been limited to grading, drainage and bridges. The next contract will include 11.315 miles of work in Creek Co. Latest contracts awarded include: Grading and drainage, Lincoln Co., 5.996 miles, to S. E. Evans Constr. Co., Fort Smith, Ark., $476,821 on which estimated cost was $507,659; 3.892 miles of grading and drainage to M. E. Gillioz, Monett, Mo., at $410,771 on which the estimated cost was $442,698. Guard rail, also let to Gillioz at $488,650, includes 242,000 ft. of metal plate guard rail and 6,000 ft. of curved guard.

Tractor, Backhoe, Derrick

(*Continued from page 44*)

over. Generally there is some surplus fill left which can either be moved into an adjacent lot which is being graded, or if necessary loaded into a dump truck and hauled off. After all surplus dirt and rocks are moved the hand crew goes over the sidewalk and sub-lawn with hoes and rakes and smooth up the surface wherever necessary.

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Get full details of this month's new products . . . mail your Readers' Service card today.

up from the truck and lowers them into the trench, and holds them in place while we are yarning joints. The derrick is equipped with an automatic brake which is released when the load is being picked up but is in operation at all times when the load is being lowered. The load stops immediately upon release of the control lever when it is being picked up or lowered down; and the load can be held in any position, within a fraction of an inch, if necessary. We use this derrick in laying pipe, setting hydrants, gates, fittings and pulling rocks out of the trench, loading them onto the truck to transport to the nearest place where we can dispose of them.

This derrick is mounted on the front end of the truck body just behind the cab and leaves practically all of the platform body clear for pipe or equipment. We usually dump our dirt away from the center of the street so that we can get close enough to the trench to use this derrick, as the boom is not long enough to reach over the dirt and to the center of the trench. It is somewhat harder to clean up the street when the dirt is dumped in the gutter, on the sub-lawn, or on the sidewalk, but feel that we inconvenience traffic less by doing this, and that it is much easier to handle pipe from the street side when the trench is clear on this side.

Tunnelling Services With Water

We have had some success in tunnelling services across the street with water. We dig one hole about 5 ft. long over the main and another hole 10 or 12 feet long on the opposite side of the street. Our first experience with tunnelling with water was with iron or brass pipe. The pipe is laid in the 12 foot section of the trench and pointed exactly for the center of the hole near the main. It is properly elevated so it will hit the main end as near as possible to 5½ feet below grade. A section of garden hose is connected to the service pipe and to the nearest hydrant if one is available. If not, we first tap our main and connect onto the corporation cock for our water supply. Water is turned on and the pipe pushed through as fast as the water washes the dirt away in front of it. If the end of the pipe hits a rock we usually let the water run for a little while to soften the dirt up around it, pull the pipe back a

bit and try again. If it proves to be a big rock there is nothing else to do but try again on the other side of the trench, or go a bit deeper. We have had success in tunnelling as far as 20 or 25 feet in this manner. We always measure the length of pipe that we are tunnelling so we know immediately if we are bypassing the hole at the main. It is quite possible for the pipe to hit the side of a rock and be thrown considerably off course.

We are now using copper tubing for practically all services. We have tried the above experiment with Type K, heavy copper tubing and have had fair success with it. This copper is very soft and of course bends easily if it hits an obstruction. It is first necessary to straighten the copper just as straight as possible before starting to tunnel and to straighten the copper as it is taken off the coil. There is much more possibility of the copper hitting an obstruction and not coming out where you planned it. We sometimes tunnel through with a section of iron pipe first and make the copper fast to the end of the iron pipe and pull it back through the tunnel. This is worth trying if it is impossible to push the copper through. We find that it is not practical to attempt to push the copper tubing through if it goes hard. The copper will kink and it may be impossible to get it to go through, or to pull it back.

Last year we bought eight sections of hollow drill steel in 30" lengths, equipped with couplings so that they might be connected together as needed, and have experimented somewhat with this for tunnelling across the street. We use a side hole bit which does not bother about clogging with dirt, and use this steel in our drilling jackhammer. This drill will go through frozen ground or any kind of soil conditions including rocks and ledge. The air blows out most of the dirt and leaves a fairly clear hole to run the pipe line through. We have made several successful tunnels with this drill, but have been bothered on several other occasions by the steel sticking in the tunnel. We had a coupling made up which is fastened onto the drill steel on one end and onto ¾-in. iron pipe on the other end to connect the pipe or tubing to the drill and pull it back through the tunnel. We will be able to give a better report on this after we have used it a bit more.

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PUBLIC WORKS EQUIPMENT News

For Better Repairs to Winter-Damaged Roads

A new road material, made by mixing special bituminous binders with aggregates to form a premix

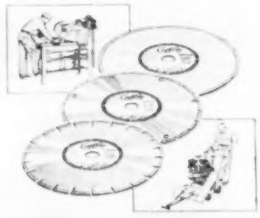
Komac on the left side.

with many advantageous qualities has been developed by Koppers. Pressed into chuck holes, it makes a long-lasting patch. It has been used in below freezing weather to repair holes. It is claimed to resist heavy traffic, freezing and thawing and summer heat. It can be stockpiled, removed, handled and placed in winter weather: it does not adhere to the equipment; is non-skid; no special preparation of the hole is necessary before patching; and heating is not necessary before use. Called Komac, it will be produced in limited quantities this fall. Write Tar Products Division, Koppers Company, Inc., Pittsburgh 19, Pa., or use the coupon.

Use coupon on page 101; circle No. 9-1

How to Cut Concrete and Asphalt Faster

These concrete cutting diamond blades are designed to cut street pavements, building floors, drives, walks and runways. Concrete containing limestone aggregate can be cut at the rate of 10 ft. per minute when cutting to a depth of 1 inch. Asphalt, with the same aggregate and with the same depth of cut, is sliced at the rate of 12 ft. per min.



Asphalt and concrete saws.

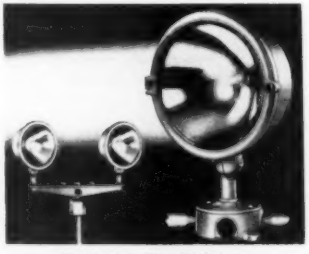
Specifications are available for all types of aggregate and age of concrete. Blades are made in diameters from 8 ins. to 18 ins. and in thicknesses from 5/32 to 7/64 for use on any type of concrete saw. Data from Clipper Mfg. Co., 2800 Warwick, Kansas City 8, Mo., or by using the coupon.

Use coupon on page 101; circle No. 9-2

High Intensity Spotlight for Protection and Lighting

With only a 300-watt rating, this spotlight provides 100,000 candlepower, concentrating its entire light output in a long oval beam. It is excellent for protection lighting of vulnerable spots, and also for general floodlighting and night work. Information from Stonco Electric Products Co., 489 Henry St., Elizabeth 4, N. J., or by using the coupon.

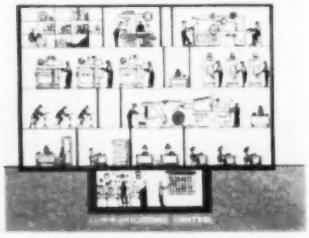
Use coupon on page 101; circle No. 9-3



Protective floodlighting.

A New and Helpful Civil Defense Film

Covered in this straightforward film, which is low in emotion and high in "how-to-do-it," are such



From Cornell's new film.

things as: How to select the chief warden in an industrial plant; how to recruit a civil defense corps; how to set up a central control room; how to establish a first aid room; and similar data. It includes comments by Hanson Baldwin, military expert of the New York Times and narration by Harry Marble of CBS. It is in technicolor and is based on studies made by the NSRB with the assistance of the Department of Defense. Title: "Target: USA." Full data from Cornell Film Co., 1501 Broadway, New York 18, N. Y.

Use coupon on page 101; circle No. 9-4

Chlorination with HTH in Tablet Form

HTH can now be used in a specially engineered feeder which is designed to dissolve HTH tablets and dispense the resultant available chlorine solution at rates which can be accurately controlled and quickly varied to cover a wide range of operating demands. The tablets are ¾ in. diameter and ¼ in. thick, weighing 1/6 oz. The hypochlorinator handling these tablets is 17 ins. high, and 8 ins. in diameter.

with no moving parts. The standard model will produce up to 6 pounds of chlorine with one filling. Installation is easy and rapid; maintenance and upkeep are said to be negligible. More information from Mathieson Chemical Corp., Baltimore 3, Md., or by using the coupon.

Use coupon on page 101; circle No. 9-5

High-Intensity Airport Runway Lights

By providing clearer definition of airport runways during foggy or night operation, this new bidirectional high intensity runway light assures safer instrument landings of aircraft. Besides directing two main light beams up and down the runway, a one-piece 360° glass lens provides "off-runway" light for circling. These lights are available with clear, clear-yellow or green lenses, using 200-watt, 6.6 amp, T-14 bulb, with color filters inside the lens. Further data from Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., or by using the coupon.

Better for fogs and night.

Use coupon on page 101; circle No. 9-6

Blacklight Makes Leak Detection Easier

Utilizing the principle that certain materials will fluoresce under carbon and mercury arc lights, this exploring lamp has been developed for locating leaks in closed vessels. An extremely dilute solution of a fluorescing agent is placed in the container or vessel to be tested, and the blacklight used, in darkness of course. The slightest flow through the wall is unmistakably picked up by the rays from the blacklight lamp. No small leaks are missed. Full data by using the coupon.

Use coupon on page 101; circle No. 9-7

Motorola's pack set.

Pack Set Power Supply for 2-Way Radio

A new pack set power supply is now being produced which will increase the utility of Motorola's FM 2-way radiophone pack unit by making it convertible to semi-fixed or mobile application, while preserving the dry battery supply for portable operation only. The power supply makes it possible to operate the pack set from either a 117-volt AC or 6-volt DC primary power supply. Full data from Motorola, 4545 West Augusta Blvd., Chicago 51, Ill., or use the coupon.

Use coupon on page 101; circle No. 9-9

Slash digging costs! Speed up jobs!

use the NEW

IMPROVED HENRY BACKHOE

Slash your digging costs with this fast, accurate, sturdy Henry Backhoe. It's built to TAKE it. Does an amazing digging job. Very flexible. Ideal for laterals, footings, septic tanks, graves, and EVERY digging operation. Can dig 7 feet deep. Bucket width can be 12", 14", 16", or 18" (36" for graves). Maximum reach 11 ft.—bucket swings 60° to either side of trench center. Has four powerful double acting hydraulic cylinders. Perfect operator control. Stops automatically at center to keep trench sides straight. A complete unit. Is quickly attached to your tractor. If you want to simplify EVERY digging job, SLASH costs and speed up the job, get a Henry Backhoe—NOW. See your dealer or write direct.

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The Nelson "LOADALL" loads SNOW and all Ice Control Materials

No Belt Changes or Attachments

Now—one machine for all your winter loading work!

. . . Loads SNOW—or sand, salt or cinders without belt changes or special attachments! All-year utility yet priced to fit limited budgets. Low first cost—minimum maintenance expense.

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Plastic Waterproof Cover for Machine Tools

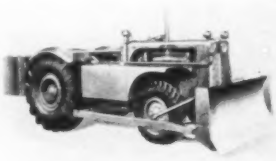
Plastic waterproof covers are available for protecting machine tools when not in use. They fit any make of tools and keep off water, dust, grease or grit. They are available in six sizes. For information, write South Bend Lathe Works, South Bend 22, Ind., or use the coupon.

Use coupon on page 101; circle No. 9-10

New Caterpillar Bulldozer for DW10 Tractor

The new 10S bulldozer, announced by Caterpillar, is designed for use with the DW10 rubber tired tractors. This is a cable controlled unit for heavy duty work. To provide more traction for the driving wheels of the tractor, four counterweights, weighing 7,000 pounds, are located in a box at the rear of the tractor. Full information from Caterpillar Tractor Co., Peoria 8, Ill., or use the coupon.

Use coupon on page 101; circle No. 9-11



Caterpillar's new bulldozer.

Ejector for Handling Small Sewage Flow Better

For flows from 30 gpm to 150 gpm, this pneumatic sewage ejector has many advantages. Special features are (1) simplicity; (2) no moving parts; (3) ability to pass solids up to the size of the inlet and discharge valves; and (4) complete reliability. Rotary air compressors of the multi-blade type supply the air pressure for operation. An excellent data sheet, with a worked-out illustrative example is available on request. Write Ralph B. Carter Co., Hackensack, N. J., or use the coupon.

Use coupon on page 101; circle No. 9-12

How to Measure Those Decibels

Not much larger than a flashlight, this sound level meter will measure accurately noise, sound and vibration which often have harmful effects on personnel. The sound level

How many decibels?

range is from 34 to 140 db above the standard ASA reference level of 0.0002 dynes per sq. cm. Hearing aid batteries are used and have a life of about 50 hours. This meter meets all specifications of the ASA for sound level meters. Full data from Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass., or by using the coupon.

Use coupon on page 101; circle No. 9-13

For Copying Drawings, Tracings and Large-Sized Records

This copying machine is designed for medium volume production of prints from tracings, engineering drawings, balance sheets or any large-sized record. Printing width is 46 ins. Exposure speeds are up to

1. PERFORMANCE—The ability to handle larger loads per grab means a higher daily plant capacity.

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It tells you how to select the proper bucket or grapple and contains typical incinerator bucket specifications.

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PALMER FILTER BED AGITATORS

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Hundreds of repeat orders from satisfied customers prove that longer runs at higher rates with less wash water consumption are absolute facts, not claims.

Try *Agitators* and *Anthrafilt* in one Filter and you too will eventually equip your entire plant.

For Information Call or Write

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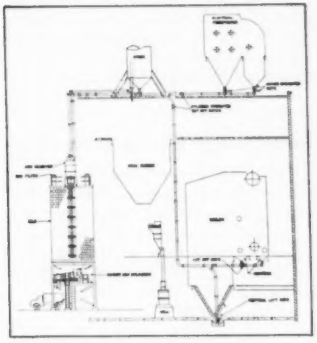
PHONE 5-3416

95 ins. per minute. Installation consists of plugging into a 115-volt line. No special lighting, dark rooms or developing trays are needed. More data from Charles Bruning Co., 100 Reade St., New York, or use the coupon.

Use coupon on page 101; circle No. 9-14

Vacuum Ash Handling and Soot-Ash Control

The Beaumont-Birch vacuum ash handling system eliminates need for any manual handling of the ash, reducing maintenance and supervision to the minimum. Ash, fly ash, soot and dust are conveyed in a dry condition by means of a vacuum through pipes to a receiver. A recent installation was in the new electric power plant addition for the city of Jamestown, N. Y. Full data by using the coupon.

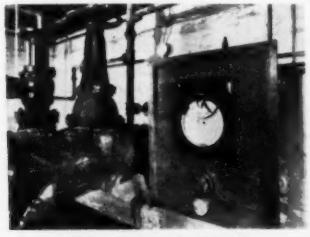


Eliminates ash and soot.

Use coupon on page 101; circle No. 9-15

Pump Flow Control Based on Inflow to Wells

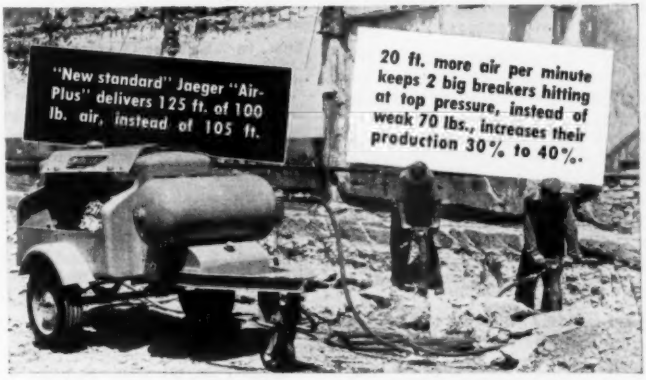
Well water at the Provincetown pumping station of North Truro, Mass., is protected against salt water intrusion by pump controls which are operated by the rate of inflow to the wells. If pumped at an excessive rate these wells, on the tip of Cape Cod, are subject to sea water seepage. Details of the instal-



Keeps salt out of wells.

same men, same tools do

4 days' work in 3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20 ft. more air per minute keeps 2 big breakers hitting at top pressure, instead of weak 70 lbs., increases their production 30% to 40%.

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deliver 15% to 25% more air *at lowest cost per cubic foot of any compressors on the market,* to run today's tools at their full efficiency, greatly increasing your production with the same men and tools.

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STRAIGHT-LINE, PENCIL BEAM IS VISIBLE FROM ALL ANGLES, NEARBY OR AT REALLY GREAT DISTANCES.

Its exclusive fresnel globe is moulded with optically perfect prisms, designed to concentrate the light rays into a parallel, vertical beam of greatest possible intensity assuring a safety and warning light of greatest visibility. The NIGHT WATCH is the best burning lantern of its kind.

The NIGHT WATCH is strongly made, finished in Contractors' Yellow; Ruby Fresnel Globe with Peep-hole. Also accommodates Dietz Little Wizard and Little Giant Globes. Burns a generous 100 hours. 8" high, 6¾" diameter at non-tip base.

Write for circular.

Exclusive trip-lock releases chimney for easy lighting, etc. Self-locking.

R. E. DIETZ COMPANY • SYRACUSE 1, N. Y.

Get full details of this month's new products . . . mail your Readers' Service card today.

lation, which employs a Foxboro Rotax flow controller, are available from the Foxboro Co., Foxboro, Mass., or by using the coupon.

Use coupon on page 101; circle No. 9-16

If You Want to Mix a Half Yard of Concrete

This is a nifty-looking concrete mixer and Smith says that it has "advanced features that make for speed and economy." Engine or electric motor driven; water measuring control; oversize pneumatic tires; fold-back distributing spout; self-priming centrifugal water pump. Labeled 16-S, it is non-tilt; capacity is half a yard. More information by using the coupon.

Use coupon on page 101; circle No. 9-17

Float Guide That Won't Stick for Sewage Installation

The primary advantage of this basket type float guide is the elimination of sticking of the float, due to grease accumulations in sewage installations. It also permits visual inspection of the condition of the float and of the accumulation of matter in the float guide basket. Generally the basket does not have to be cleaned oftener than three or four times a year. Information and a data sheet on this trouble-saving device will be sent on request to Healy-Ruff Co., 2255 University Ave., St. Paul 4, Minn., or by using the coupon.

Use coupon on page 101; circle No. 9-18

Saw for Cutting Concrete and Asphalt

Concrete Sawing Equipment's new self-propelled saw for cutting concrete and asphalt has a 13.3-hp engine, and the depth of cut depends on the size of the blade. It assures a smooth, straight edge for patching; it is also used for installing expansion and contraction joints, grooving for crack control, and grooving ramps and steps for safety. For more information on this No. 51 saw, use the coupon.

Use coupon on page 101; circle No. 9-19

New Crawler with Rubber Track Shoes

The 30 Terretrac is a new crawler tractor being introduced by American Tractor Corp. It weighs less than 4,400 lbs., fully equipped with hydraulic bulldozer or angledozer. Special rubber track shoes have been developed which are advantageous on many kinds of work. You can get any gauge you want from 42 to 72 ins. Ground clearance is high. Other attachments include bucket loaders, winches and scoops. Full data by using the coupon.

Has rubber track shoes.

Use coupon on page 101; circle No. 9-20

Small Pumps for Many Purposes

Adaptable to small cooling towers, domestic water, booster and similar work, these pumps are furnished in 2-inch and 1½-inch sizes, operating at 3450 rpm, with capacities up to 100 gpm at 120 ft. head. They are centrifugal, close-coupled, motor driven. Ask for Catalog D851 from Economy Pumps, Hamilton O., or use the coupon.

Use coupon on page 101; circle No. 9-21

THE SEWER SCOOTER®

100% Self Propelling SEWER CLEANER

GETS RESULTS QUICKLY

Clean and Easy to Handle

The Sewer Scooter is built for 6" to 96" lines. Restores Lines, MODERATELY PRICED. The Model A-3 for 8", 10" and 12" lines and Manhole Jack set with 400' Control Rope is $470.00, (f.o.b. plant). Keep your lines clean this economical way. Write for engineering bulletin.

MAIL COUPON TODAY

Send me latest engineering bulletin on the Sewer Scooter

Name .....

Title .....

Address .....

FITZGERALD ENGINEERING CO., INC.

233 S. Dixie Highway, Coral Gables 34, Fla.

PLAN BETTER SEWER LINES

GASKETS and WITH WESTON FORMS for ALL SEWER PIPE JOINTS

• No jute used—gasket centers spigot. • Definite space in each joint for cement. • Form confines cement-grout to lower portion of joint. • Particularly advantageous in water-bearing trenches. • Infiltration minimized.

L. A. WESTON CO. Adams Mass.

Order Now . . . Handbook of

Small Sewage Treatment Plants

TO help small communities get the most modern and usefully long-lived plants possible the Editors of PUBLIC WORKS and outstanding authorities in the field prepared a series of articles on Small Treatment Plants. These seven articles, first published in PUBLIC WORKS, cover volume of flow, primary settling, sludge digestion and disposal, activated sludge and small trickling filter details and design. The comments of a number of State Sanitary Engineers show typical State Board of Health requirements and recommendations.

Contains Design Data

Plant layouts, tables and design details especially adapted to small plants are included together with money saving suggestions.

Order Now

A copy of this booklet will be mailed postpaid promptly on receipt of $1. Money back if not fully satisfied.

Waterproofing Masonry, Brick and Stone

This material, Flexseal, is claimed to penetrate an eighth to a quarter inch into surfaces and to turn water like the well-known duck's back. It is colorless and it retards efflorescence. It comes as a thin liquid that can be sprayed, brushed or poured on. Full data from Flexrock Co., 36th and Filbert Sts., Philadelphia 4, Pa., or use the coupon.

Use coupon on page 101; circle No. 9-22

Miami Water Plant Uses Diesel Engines

The Southwest Water Treatment Plant of Miami, Fla., is now under construction. Four diesel engine driven pumping units have been ordered from Worthington. The engines are 825 hp each. One of them is so arranged that it can be used for operating a 750 kva generator.

Teletalk Speeds Road Lining Work

Iowa's State Highway Department uses special trucks for lining state highways. The two-man team, consisting of the truck operator in the front and the spray operator at the rear always found communications difficult. Two of these trucks are now equipped with Webster Teletalk systems which permit two-way voice operation and has resulted in speeding up of the work.

Water and Sewage Construction in Georgia

At the present time water and sewer construction projects are under way in all parts of Georgia.

A partial list of cities with some type of water project recently completed or under construction include Abbeville, Bainbridge, Cleveland, Colbert, Dawson, Dalton, Franklin, Folkston, Forsyth, Garden City, Greenville, Hampton, Jonesboro, Jefferson, Kennesaw, Macon, Pelham, Perry, Roswell and Winder.

New sewage treatment plants are starting, are under construction or recently completed at Bremen, Chipley, Commerce, Dallas, Dalton, DeKalb County, Eatonton, Gracewood, LaGrange, McRae, Rockmart, Savannah, Statham, Vidalia, Wrens and Wirder.

In addition to the above listings which are not entirely complete, about an equal number of cities and towns have water and sewer projects in various planning stages.

Parking Spaces Required by Size of City

An analysis of the results of parking surveys carried out in 46 communities has been made by the Highway Transport Research Branch of the U. S. Bureau of Public Roads. This has shown that: (1) The total number of parking spaces per 1,000 population ranges from 89 in small towns to 12 in large ones. (2) The number of parked vehicles per 1,000 population during an 8-hr. business day ranges from 446 in small towns to 34 in large ones. (3) The ratio of demand to supply of parking spaces ranges from 1.34 in small towns to 4.67 in large ones. (4) Central business districts are proportionately greater traffic generators in small towns than in large. (5) The average time for which vehicles are parked is greater in large towns than in small. (6) Peak-volumes of traffic are generally one-third greater than average hourly volumes.

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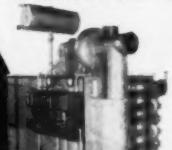
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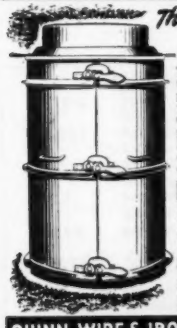
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230. Good advice on meeting the problem of snow fighting is offered in illustrated stories in "Caterpillar's" new 16-page booklet that shows how City, County and State highway departments and road commissions meet the challenge. Be sure you are ready to keep traffic moving. Use handy coupon, or write Caterpillar Tractor Co., Peoria 8, Ill.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, % Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Something Different! "Pipe Dreams" Full of Fun and Good Sense

22. The Universal Concrete Pipe Company will be glad to send you regular issues of "Pipe Dreams", their delightful pocket-size magazine full of American philosophy and good cheer. No cost or obligation. Just write Universal Concrete Pipe Company, Dept. PW, 297 South High St., Columbus 15, Ohio.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new Sewe RodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34 Calif.

How You Can Dispose Of Sewage Solids

54. Nichols Herresboff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.

Using Sewage Sludge Gas For Power Generation

90. Faribanks-Morse dual fuel engines can operate on either sludge gas or oil to provide steady power output despite fluctuations in gas supply. Bulletins are available on several sizes to meet your needs. Write, giving exact requirements to Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 5, Ill., or use handy coupon.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 510 Poplar Ave., Connersville, Ind.

Comminutors for Automatic Disposal of Coarse Sewage Solids

152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for every size plant and furnish details of hydraulics and typical installations. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Fast and Easy to Handle Sewer Cleaning Machine

180. Get full details on the Sewer-Scooter for which sewage furnishes the operating power and which is operated entirely from street level. Bulletin on these time-saving machines available from Fitzgerald Engineering Co., Inc., P. O. Box 289, Coral Gables, 34, Fla., or by using coupon.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Pump and Machinery Corp., Harrison, N. J.

Data on Design of Grit Collectors and Washers

202. Grit collection and separation of organic materials from settled grit is described in Link-Belt Bulletin 1942. Typical installations are shown, and design data is provided.

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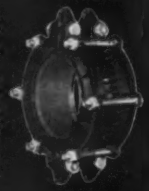

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together with specifications. Use coupon for copy, or write Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 002. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia 42, Pa., or use the coupon.

WATER WORKS

How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive yet understandably written story of the development of the Accelator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infilco Inc., Box 5033, Tucson,, Ariz. Ask for Bulletin 1825.

Helpful Valve and Fittings Catalog for Engineers

42. A complete 44-page catalog covering the M and H line of water works and sewage disposal equipment and accessories is offered to help design engineers and contractors who specify valves, hydrants and fittings. Get Catalog 34 from M & H Valve & Fittings Co., Anniston, Ala. by using the handy coupon.

Engineering Data on Diatomite Filters

44. Detailed information and typical plans of Sparkler diatomite filters for swimming pools of municipal water systems is available to engineers and municipal officials. These filters feature self-cleaning filter elements which cuts wash water to a minimum. Get this material now by using coupon. Sparkler Manufacturing Co., Mundelein, Ill.

Quick Way to Locate Leaks and Pipe

57. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetic Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Factors to Consider in Elevated Tank Selection

80. An interesting discussion of the factors to be considered for selection of elevated capacities and sizes, required fire flows and other useful data are included in a bulletin on elevated water storage published by Pittsburgh-Des Moines Steel Co., Neville Island P. O., Pittsburgh 25, Pa.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Engineering Data on The Permutit Precipitator

91. The Precipitator removes impurities from water by precipitation, adsorption, settling and upward filtration; requires less space, less chemicals, less time than any previous design of reaction and settling tank. Data on operating principles, recommended sizes, design details and specifications are included in 20-page illustrated bulletin No. 2204A. The Permutit Company, Dept. PW9, 330 West 42nd St., New York 18, N. Y. Use the coupon for your copy.

Painting Water Tanks For Longer Protection

94. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Dept. 9 P, Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

How to Tap Concrete Pressure Pipe

126. The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14½" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, gooseknecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

How to Design Chemical Feed Systems

179. In a 12-page booklet published by Proportioneers, the many factors which enter into the design of a chemical feed system are discussed, and the types of systems used described in detail. These include dry feed, both volumetric and gravimetric and solution feed of the decanter and positive displacement pump types. Feeder controls are considered in detail. Send now for File No. RP-9080 by checking coupon. Proportioneers, Inc., Providence 1, R. I.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

How Your Filter Washing Can Be Improved

188. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Helpful Data on Well Water Systems

173. A comprehensive, 48-page book on Layne Water Well Systems covers gravel wall wells, underreaming, cemented walls, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. PW, Memphis 8, Tenn.

Handy Calculator for Cast Iron Pipe

175. With the handy Cast Iron Pipe Calculator you can determine at a glance the class, weight and dimensions of bell and spigot pipe. This slide-rule type calculator is absolutely free. Use coupon or write R. D. Wood Company, Public Ledger Bldg., Philadelphia 5, Pa.

Sealed Repair for Broken Mains

203. Damaged water mains can be quickly and permanently repaired with Skinner-Seal split coupling clamps. Special gasket and clamp design withstands full fire-fighting pressure. For 2" to 16" pipe. Get details on this and other clamps from M. B. Skinner Co., Dept. PW, So. Bend 20, Ind. Check coupon now.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

Book Tells How to Control Algae

257. A booklet giving details on the control of various microscopic organisms frequently found in water supplies is offered by Phelps Dodge Refining Co., Dept. PW, 40 Wall St., New York 5, N. Y. Check coupon for your copy.

Have You Investigated The Chlorinizer?

273. Be sure to check the Builders-Providence "Chlorinizer" wherever chlorine gas is to be used. Wide range of metering for delivery of chlorine-water solution; long life control valve; safety features and many other points are covered in bulletin 840-G27, available from Builders-Providence, Inc., 356 Harris Ave., Providence 1, R. I. Check the coupon for your copy.

Corrosion Protection For Water Works

280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bitumastic enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Dept. 555T, Pittsburgh 19, Pa.

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● RIDGID LonGrip reamers have that extra-long-taper that cleans the burr smoothly out of pipe or conduit almost without effort. Just a few light ratcheted strokes do the job. Furnished complete with ratchet handle. No. 2 Reamer unit sold separately for use in RIDGID 00R small ratchet die handle. Two sizes, No. 2, ⅛" to 2" pipe; No. 3, ⅜" to 3" pipe. These RIDGID new type pipe reamers really do save your time, work—and pipe. Ask for them at your Supply House.

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WORTH TELLING . . .

by Arthur K. Akers

★ **Kenneth S. Watson,** formerly assistant director of the Ohio River Valley Sanitary Commission, has been made co-ordinator of industrial waste treatment for the **General Electric Company.** He will serve on the staff of **Robert Paxon,** vice president in charge of manufacturing policy at Schenectady, N. Y.

★ **Harvey Howe,** assistant vice president of **Lock Joint Pipe Company,** is acting as director of the Water Resources Division of the NPA, to handle water, sewage, and industrial wastes problems, at Washington until a permanent director is named.

★ **George E. Symons** ("Doc." to you) has resigned as managing editor of WATER & SEWAGE WORKS to set up his own consulting service in the field of water, sewage, and industrial wastes matters, at Larchmont, N. Y. Doc will continue as a contributing editor to his old magazine and as editor of **B-I-F Industries** "Courier" at Providence. Our best wishes for him also continue.

Mr. Symons

★ Pardon our smile, but an OPS bulletin just received seemingly announces that Anti-Freeze has just been frozen. Reading farther, we noted with relief that it's the price that's frozen—not the product.

★ **Municipal Service Company,** Kansas City, Mo., has appointed **E. Allen Bailey** Chicago district manager for seven states. Their products: mechanical equipment for water and sewage plants.

★ **National Fireproofing Corporation,** Pittsburgh, has named **Harry F. Toner** as western district sales manager, at Chicago.

★ **George E. Hopf** is manager of the newly-created marketing division of **Henry Disston & Sons, Inc.,** manufacturers of saws and other special tools, at Philadelphia.

★ **Atlas Mineral Products Co.,** Mertztown, Pa., announces **Edison C. Sickman** promoted to general sales manager; **Robert C. Evans** to executive assistant to **Kenneth T. Snyder,** general manager of the western division, at Houston.

★ **W. E. Madden,** formerly vice president of **George Haiss Manufacturing Company, Inc.,** New York, is now director of sales. Haiss is a part of **Pettibone Mulliken Companies,** Chicago.

★ **William C. Johnson,** a native of Birmingham, Ala., and executive vice president of **Allis-Chalmers Manufacturing Company,** Milwaukee, died July 26 of a heart attack.

★ **J. Don Carpenter,** vice president of **Gannett, Fleming, Corddry, and Carpenter,** consulting engineers of Harrisburg, Pa., is the new president of Pennsylvania Society of Professional Engineers.

★ **V. de P. Gerbereux** has been appointed manager of the centrifugal pump sales division of **Worthington Pump & Machinery Corporation,** Harrison, N. J., vice A. H. Borchardt elected a vice president for all pump sales. **William J. Fleming** now heads Worthington's construction equipment sales, at Dunellen, N. J. The corporation is also building a new vertical pump plant at Succasunna, N. J.

Mr. Gerbereux

Mr. Borchardt

★ Sergeant: "Why is it important not to lose your head in an attack?"

Draftee: "Wouldn't leave no place to put my helmet."

—THE SAFER WAY

Whether your daily water consumption demands be 3,000,000 gallons or hundreds of times that figure, Lock Joint Pipe Company is prepared to provide a supply line for your requirements.

In the last few years the Company has supplied not only hundreds of miles of large diameter pipe but also more than a million feet of 16" to 24" pipe for municipalities and industry. This has been made possible through the establishment of three permanent manufacturing plants. Lock Joint Concrete Pressure Pipe from 16" to 42" in diameter, produced at these plants, can be shipped economically to all parts of the country —for both major installations and minor extensions.

Our representative will be glad to discuss with you any water supply or transmission project which calls for pressure pipe 16" in diameter or larger. You will find that Lock Joint Concrete Pressure Pipe's superior characteristics of long life, continuous high flow and negligible upkeep will recommend it above all others for any permanent water supply installation.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

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Est. 1905

P.O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich.

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Basic research, for example, while not necessarily essential to each particular installation, is, nevertheless, the life blood of sound equipment. W&T research developed the visible vacuum principle, residual recording, the Break-Point Process and countless other advances in the art of chlorination.

This same research is constantly at work to help you solve your technical problems and to insure that the W&T equipment you buy is up-to-date in every respect and will not be outmoded before its time. The desire for that assurance may be another reason for the ever-growing demand for W&T Chlorinators.

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